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CHAMBERS'S ENCYCLOPÆDIA

A DICTIONARY OF UNIVERSAL KNOWLEDGE

NEW EDITION

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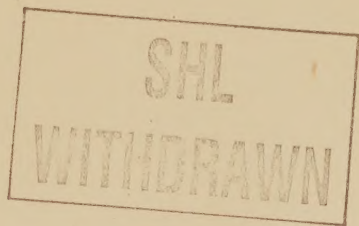
DAVID PATRICK, M.A., LL.D.

AND

WILLIAM GEDDIE, M.A., B.Sc.

VOLUME II

BEAUCAIRE TO CATARACT

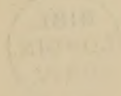


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Among the more important articles in this Volume are the following:

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		CATARACT.....	Dr R. A. LUNDIE.

A great many of the articles named above are new; others written for earlier issues of this Encyclopædia have been so thoroughly revised by their authors as to be virtually new. In addition to these many other revisers have taken part, including Professor J. A. S. WATSON (on Agriculture), Mr CHARLES MORRIS (on America), Mr C. INGLIS CLARK and Mr WILLIAM MORISON (Chemistry), Dr MARY T. RANKINE (Economics), Sir ANDREW FRASER and Mr G. E. SHEPHERD (India), Sheriff IRVINE and Sheriff DUNBAR (Law), Professor WILLIAM PEDDIE (Mathematics and Physics), Dr JOHN D. COMRIE (Medicine), Mr R. C. MOSSMAN (Meteorology), Captain H. M. JOHNSTONE, R.E. (Military subjects), Admiral Sir REGINALD TUPPER, K.C.B. (Naval subjects). The article BULGARIA makes use of unpublished official sources.



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Beaucaire, a town in the French department of Gard, on the right bank of the Rhone, opposite Tarascon, with which it is connected by a suspension-bridge, 14 miles SSW. of Avignon. Vessels enter its harbour by a canal communicating with the Mediterranean. A great

fair, established in the 13th century, was once one of the principal occasions of trade between France, Italy, and the East, and was attended by 300,000 strangers. The fair is still the scene of a brisk trade in silks, wines, oil, southern fruits, and leather. Pop. 7000.

Beauce, a district of France, partly in the departments of Loir-et-Cher and Eure-et-Loire, contains some of the finest corn-land in France, and in early summer shows an almost uninterrupted plain of waving corn. Its capital is Chartres.

Beauchamp, ALPHONSE DE, historian and publicist, born at Monaco in 1767, entered the Sardinian military service, but in 1792, on the outbreak of the war with France, refused to bear arms against the republic, and obtained his discharge. Being, however, suspected of treasonable designs, he was imprisoned for some months. After his liberation he returned to Paris, where, on the fall of Robespierre, he obtained a situation in the office of the minister of police, and had the surveillance of the press. Here he commenced his *Histoire de la Vendée et des Chouans* (3 vols. Paris, 1806; 4th ed. 1820), for which Fouché supplied the materials. As this work displeased the emperor, Beauchamp was banished to Rheims, but was recalled in 1811, and again received a subordinate appointment, which he lost in 1814. At the Restoration he received a small pension, and he died 1st June 1832. Beauchamp's numerous historical works include histories of Brazil, Peru, the campaign of 1814-15, and a life of Louis XVIII.; and to him have also been ascribed the *Mémoires de Fouché*.

Beauclerk, TOPHAM (1739-80), who figures in Boswell's *Johnson* as the loved and intimate friend of the lexicographer, was the only son of Lord Sydney Beauclerk and a grandson of the first Duke of St Albans. He had the easy air of a man of the world who had seen much and who could describe what he had seen; his conversation was lively, and his tastes in science and literature wide and eclectic. During his friend's last illness Johnson said he 'could walk to the extent of the diameter of the earth to save Beauclerk,' and after his death wrote to Boswell, 'Poor dear Beauclerk, his wit, his folly, his acuteness and maliciousness, his merriment and reasoning are now over. Such another will not often be found among mankind.' In 1768 he had married DIANA (1734-1808), eldest daughter of the second Duke of Marlborough, two days after her divorce from Lord Bolingbroke. An artist of ability, she is known through Bartolozzi's engravings. See Birkbeck Hill's various works on Dr Johnson and his circle (1878-90), and Mrs Steuart Erskine's *Lady Diana Beauclerk* (1903).

Beaufort, an Angevin town of 4000 inhabitants, in the French department of Maine-et-Loire, 19 miles E. of Angers. Its ancient castle came into the hands of the Lancaster (q.v.) family at the end of the 14th century, and gave name to the natural and afterwards legitimated sons of John of Gaunt. The Tudor (q.v.) claim to the throne arose from the marriage of the Earl of Richmond with Margaret, daughter of John Beaufort, Duke of Somerset, whose son ascended the throne as Henry VII. Charles Somerset, natural son of the third Duke of Somerset, was created Earl of Worcester in 1514; the fifth earl was raised in 1642 to the marquisate of Worcester, and the third marquis in 1682 to the dukedom of Beaufort.

Beaufort, (1) a town and port, North Carolina, at the mouth of Newport River, has a good harbour, and some trade in rosin and turpentine; pop. 3000.—(2) A town and port of South Carolina, on Port Royal Island, and terminus of Port Royal Railroad, 14 miles from the ocean. It

has a good harbour, and is a favourite summer-resort. Pop. 2800.

Beaufort, HENRY, Cardinal, born in 1377, was a natural son of John of Gaunt, Duke of Lancaster, by Catherine, widow of Sir Hugh Swynford, and was thus half-brother to Henry IV. His parents were married in 1396, and their children were legitimated next year by Richard II. He studied at Oxford and at Aix-la-Chapelle, was consecrated Bishop of Lincoln in 1398, and in 1405 succeeded William of Wykeham in the see of Winchester. He thrice filled the office of chancellor, and was involved in all the most important political movements of his times. At the Council of Constance (1417) he voted for the election of Pope Martin V., by whom in 1426 he was made a cardinal. He strongly opposed Henry V.'s proposition to levy a new impost on the clergy, in order to raise money for carrying on the war against France; but nevertheless he lent the monarch, out of his own private purse, £28,000—in 1416 £14,000, and as much in 1421—an almost incredibly large sum in those days, and one which justifies the belief that he was the wealthiest subject of his time in all England. In 1427 the pope sent him as legate into Germany, there to organise a crusade against the Hussites. This undertaking failed; and the cardinal, having expended, in levying an English army against France, the moneys granted from Rome for other purposes, fell under papal displeasure. In 1431 he conducted the young king, Henry VI., to France to be crowned in Paris as king of France and England. Here, too, he endeavoured, but vainly, to reconcile the Duke of Bedford with the offended Duke of Burgundy. He died at Winchester in 1447, within seven weeks of the murder of his great political rival, the Duke of Gloucester. He ruled England when self-government was first being tried successfully, and was enlightened in his foreign policy; after his death all went wrong. He and his official Lyndwood held the pope to be above the council. See a work on him by L. B. Radford (1908).

Beaufort, JANE, Queen of Scotland, was a daughter of John Beaufort, first Earl of Somerset and Marquess of Dorset, son of John of Gaunt and Catherine Swynford, and was therefore niece to the Cardinal. She married James I. of Scotland, and was wounded in defending him against his murderers, whom she punished with ferocity. As guardian of her son James II. she came into conflict with Crichton and Livingston, and married Sir James Stewart of Lorne. She died in 1445. See JAMES I., JAMES II.

Beaufort Scale. See WINDS.

Beaufort West, a town of the Cape Province, South Africa, stands near the foot of the Nieuwveld Mountains, 339 miles by rail NW. of Capetown, and is the largest town (pop. 6000 in 1921) in this part of the Karroo. Its staple industries depend on the wool produced in the district, throughout which, on account of scanty rainfall, agriculture is possible only with ample irrigation.

Beaugency, an ancient town of France, in the department of Loiret, on the right bank of the Loire, 16 miles SW. of Orleans by rail. It was successively in the hands of the Huns, Saxons, Normans, and English; and it sustained great damage during the religious wars of the 16th century. Here the French army under General Chanzy was severely defeated in a series of desperate struggles, 7th to 10th December 1870, by the German force under the Grand-duke of Mecklenburg. Pop. 3000.

Beauharnais, ALEXANDRE, VICOMTE DE, born in 1760 of an ancient French family in the

island of Martinique; served, under Rochambeau, in the American War of Independence; and in 1789 eagerly embraced the French Revolution, voting, on the night of 4th August, for the abolition of privileges and the political equality of all citizens. As a reward for his constancy to the cause of liberty he was named Secretary of the National Assembly and subsequently member of the military committee, but largely forfeited his popularity by venturing to praise and defend the conduct of General Bouillé in his sanguinary suppression of the insurrection at Nancy. The flippant manner in which he received the news of the flight of Louis XVI. was eminently characteristic of the man. He merely rose and said to the Assembly: 'Gentlemen, the king has just gone off; let us pass to the order of the day.' In 1793 he declined the office of Minister of War, and tendered his resignation as general of the Army of the Rhine, because it had been determined to exclude the nobility from the service. During the Reign of Terror his enemies revived the report that he had participated in the surrender of Mainz, because he had remained idle with his troops for 15 days. In consequence of this accusation he was brought to Paris, tried, and sentenced to death by the revolutionary tribunal. He submitted to his fate with firmness, and died on the scaffold, 23d July 1794. In 1779 he had married Josephine (q.v.), afterwards wife of Napoleon, and his daughter Hortense in 1802 married Napoleon's brother Louis, so that he was the grandfather of Napoleon III. See BONAPARTE, and Miss Taylor's *Queen Hortense and her Friends* (1907).

Beauharnais, EUGÈNE DE, son of the preceding, was born in 1781, and after his mother Josephine's marriage (1796) with Napoleon, accompanied him to Italy and Egypt. He rapidly rose to the highest military rank, and in 1805 was made a prince of France and viceroy of Italy. In 1806 he married the Princess Amelia Augusta of Bavaria, and not long afterwards was created Prince of Venice, and declared by Napoleon his adopted son, and heir of the kingdom of Italy. Although his political power was much limited, he conducted himself in Italy with great prudence, energy, and moderation, and throughout his life maintained an honourable and virtuous character. His military talents were great, and were displayed particularly in the Italian campaigns, in the wars against Austria, and in the retreat from Moscow, in which he divided with Ney the honour of saving the French army from total destruction. The victory of Lützen was decided by his conduct. Napoleon sent him from Dresden to Italy, which he ably defended, even after Austria had joined the coalition, and Murat had deserted the cause of the French Empire. In the Hundred Days he took no part; and in the Treaty of Fontainebleau and Congress of Vienna he was allowed to retain his possessions in the March of Ancona; and large sums were granted to him in compensation for his other Italian possessions, with which he purchased the landgraviate of Leuchtenberg and principality of Eichstädt, taking his place as Duke of Leuchtenberg among the nobles of Bavaria. He died at Munich on the 21st February 1824. See the *Lives* by Aubriet (1825), Baudoucourt (1827), Montagu (1913), and his *Mémoires et Correspondance*, by Du Casse (10 vols. 1858-60).—His second son, MAX EUGÈNE JOSEPH NAPOLEON (1817-52), who in 1835 succeeded his elder brother as Duke of Leuchtenberg, married a daughter of the Emperor Nicholas of Russia; and since 1852 his descendants have borne the name of Romanowski, and ranked among the members of the late Russian imperial family.

Beaujolais, a subdivision of the old province

of Lyonnais, France, which now forms the northern part of the department of Rhône, and a small part of Loire. Its fine vineyards yield the wine called Beaujolais, of which large quantities are exported. Beaujeu was the capital. It formed at first a separate barony, came into the hands of the Bourbons in 1400, was afterwards united to the crown by Francis I., and next passed into the hands of a nephew of the Constable de Bourbon. It came by marriage to the House of Orleans in 1826, with whom it remained until the Revolution.

Beaulieu (pronounced *Bewley*), a village of Hampshire, at the head of a creek, on the verge of the New Forest, 6 miles N.E. of Lymington. A Cistercian abbey was founded here by King John in 1204.

Beaulieu (pronounced *Bewley*), a village, 10 miles W. of Inverness, with remains of a priory founded in 1232. Beaulieu Firth (7 by 2 miles) is the upper basin of the Moray Firth, and receives the river Beaulie, winding 10 miles north-eastward.

Beaumarchais, DE, the name assumed by PIERRE AUGUSTIN CARON, next to Molière the greatest French comic dramatist. Born in Paris, 24th January 1732, son of a watchmaker, he was brought up to his father's trade, and at twenty-one invented a new escapement for watches, which was pirated by a rival. The vigour with which he assailed him soon brought him into notice at court, where his handsome figure and fine address quickly procured him advancement. He was engaged to teach the harp to the daughters of Louis XV., and ere long the wealthy widow of a court official married him, whereupon he assumed the title by which he was known thenceforward. Duverney, a rich banker of Paris, also befriended him substantially and helped him to some business speculations which realised a handsome fortune, ere long largely increased by another prudent marriage with a wealthy widow. His first plays, *Eugénie* (1767) and *Les Deux Amis* (1770), had but a moderate success. The death of his benefactor Duverney in 1770 now involved the versatile but hitherto unpopular upstart in a long lawsuit with his heir, Count Lablache, in the course of which he became the idol of the populace, as the supposed champion of public rights against the corrupt tribunals of the old régime. In the first trial Beaumarchais gained his cause, but an appeal to the *parlement* formed by the chancellor Maupeou was decided against him, principally through the exertions of Goezman, one of its members. Beaumarchais carried his appeal to the public by publishing his famous *Mémoires du Sieur Beaumarchais par lui-même* (1774-78; new ed. by Sainte-Beuve, 1873), a work which united the bitterest satire with the sharpest logic, and gained for him a reputation that made even Voltaire uneasy. It fitted in with the popular feeling of dissatisfaction with existing institutions, and did much to help on the Revolution. The same brilliant satire burns in his two famous comedies, *Le Barbier de Séville*, ou *la Précaution Inutile* (1775), and *La Folle Journée*, ou *le Mariage de Figaro* (1784). The latter had a most unprecedented success, and indeed for brilliant wit it may almost be put beside the masterpieces of Molière. Figaro was a permanently enduring creation worthy to be compared with the hardly more famous Tartuffe. These plays are still popular acting plays in France, but in England are chiefly known through the adaptation of them in the grand operas of Mozart and Rossini. The later works of Beaumarchais are hardly worthy of his genius. By furnishing the American colonists with arms and money he did much to make the revolution successful. Two later law-suits cost him

his popularity, and in the troubles of the French revolution the not over-scrupulous author lost his fortune, and, suspected of an attempt to sell arms in Holland to the enemies of the republic, had even to flee from Paris for his life. In *Mes Six Époques* (1793) he has given us an account of his sufferings during that period. In his last years he became quite deaf; he died on the 19th May 1799.

See the Lives and monographs by Loménie (trans. 1857), Lindau (1875), Lintilhac (1887), and Hallays (1897); Marsan, *Beaumarchais et les Affaires d'Amérique* (1919); Elizabeth S. Kite, *Beaumarchais and the War of American Independence* (1920).

Beaumaris, a seaport and chief town of Anglesey, North Wales, is situated on the west side of the picturesque bay of Beaumaris, near the north entrance to the Menai Strait, 3 miles N. of Bangor, and 239 miles N.W. of London. It has the ivy-covered remains of a castle erected by Edward I., and a free grammar-school, and is a favourite sea-bathing resort. The bay is a safe anchorage in stormy weather. Up till 1885 Beaumaris united with Amlwch, Holyhead, and Llangefni in sending one member to parliament. The trade is inconsiderable, but there are some exports of copper and other ores, slates, marble, &c. Pop. 1800.

Beaumont, a city of Texas, on the Neches River, 84 miles E. by N. of Houston. Its excellent communications by rail and water, and the neighbourhood of forests and ricefields, had already made it a great centre of the lumber and rice trade, when rich finds of oil raised its population from 9427 in 1900 to 20,640 in 1910 and 40,422 in 1920.

Beaumont, ÉON DE. See ÉON DE BEAUMONT.

Beaumont, FRANCIS, and **Fletcher**, JOHN, a pair of the greater dramatists of the Elizabethan age, whose joint work is the result of the most famous of literary partnerships. Beaumont was the younger of the two by about five years, but he died nine years earlier than his friend. He was the third son of Sir Francis Beaumont, one of the justices of the Common Pleas, and was born at Gracedieu, in Leicestershire, in 1584. He was admitted in 1597 as a gentleman-commoner to Broadgate Hall, Oxford (now Pembroke College), and in 1600 to the Inner Temple. Two years thereafter he published *Salmacis and Hermaphroditus*, an expansion of Ovid's version of the story. Ere long he became an intimate friend of Ben Jonson and the other men of genius who assembled at the Mermaid Tavern, and here no doubt he met the poet with whom he was to form so memorable a friendship. John Fletcher was born at Rye in Sussex, in December 1579. His father was that Dean of Peterborough who disturbed the last moments of Mary Stuart with his ill-timed exhortation, and afterwards as Bishop of London, died either of chagrin at the queen's displeasure on account of his second marriage, or of the immoderate use of tobacco. The boy entered Bene't (now Corpus) College, Cambridge, at twelve, and found himself at seventeen in poverty on his father's death. We know nothing of him until 1607, when he produced the *Woman Hater*. The intimacy which now commenced was one of singular warmth, even for that age when friendships were of a more romantic cast than at present. The two lived in the same house, and had clothes and cloak and everything in common. Aubrey ascribes the 'dearness of friendship between them' to a 'wonderfull consimilitude of phansy.' Beaumont married in 1613, but died 6th March 1616. Fletcher wrote on until his death, in his last four years producing no less than eleven new plays. He died in August 1625.

The works of Beaumont and Fletcher comprise

in all fifty-two plays, a masque, and several minor poems; but it is difficult to allocate, in any satisfactory manner, the authorship of these. Professor Ward cannot trace any essential difference between the plays ascribed to both and those attributed to Fletcher alone, while he detects two styles in the plays written by Fletcher along with another than Beaumont. It used to be asserted that Fletcher contributed the vivacity and Beaumont the judgment, and that the latter chastened the exuberant fancies of the former. There seems, however, to be no foundation for this opinion, except the tradition and the fact that Beaumont's own verses are more severe and regular in form than those of the elder poet. Dyce thus assigns the authorship of the plays, with very varying degrees of certainty: By Beaumont and Fletcher, *Four Plays in One, Wit at Several Weapons, Thierry and Theodore, Maid's Tragedy, Philaster, King and no King, Cupid's Revenge, Little French Lawyer, Coxcomb, Laws of Candy, The Knight of the Burning Pestle, and The Scornful Lady*; by Beaumont alone, the *Masque*; by Fletcher and Massinger, *False One, Very Woman, The Lover's Progress*; by Fletcher and Rowley, *Queen of Corinth, Maid of the Mill, Bloody Brother*; by Fletcher and Shirley, *Noble Gentleman, Night Walker, Love's Pilgrimage*; by Fletcher and Shakespeare, *The Two Noble Kinsmen*; the remaining plays by Fletcher alone. Fletcher's collaborator in some of the later plays is, however, entirely uncertain. His own versification has many peculiar features which make his verse distinguishable from that of his contemporary dramatists. The chief of these is the frequency of double or feminine endings, in which he may be safely said to exceed any other writer of our old drama. According to Mr Fleay, the average of such endings in the plays as to all of which he and Dyce agree in considering Fletcher the sole author is 1777; that in the plays of Massinger, the dramatist next to Fletcher most given to the practice, 1059. Again, in the plays known to have been written by Fletcher alone, rhyme is used very sparingly, and prose is eschewed altogether. Professor Ward observes that the double-endings, particularly as used by Fletcher in combination with the practice of stopping the sense at the end of the verse, give so peculiar a cadence to the lines, and constitute a manner of versification from which when once adopted a poet is so unlikely incidentally to diverge, that their frequent employment in scenes of joint plays and their sparse employment in other scenes, may be fairly regarded as favouring the antecedent supposition of the presence or absence of Fletcher's hand. At the same time, too much may well be made of such mechanical tests, and it may be permitted to leave a problem that so acute a critic as the late Mr W. B. Donne regarded as insoluble in the pious uncertainty of the stationer's address to the courteous reader in the first folio edition of 1647 (the earliest, though that of 1679 was the first complete edition): 'It was once in my thoughts to have printed Mr Fletcher's works by themselves, because single and alone he would make a just volume; but since never parted while they lived, I conceived it not equitable to separate their ashes.' Fletcher undoubtedly had a share in Shakespeare's *Henry VIII*. The touch of Shakespeare is felt with considerable certainty in *The Two Noble Kinsmen*. There is a tone of music and a tread of thunder in some of the passages, to which no parallel can be found in any of the companion dramas. Only three plays were, during Fletcher's lifetime, published as joint productions. Two of these—*Philaster* and *The Maid's Tragedy*—are, with the exception of the great passages in *The Two Noble*

Kinsmen, the glory of the collection. The question has been often discussed, why these plays are called by the name of Beaumont and Fletcher, thus giving precedence to the younger and less voluminous writer. Mr Dyce's opinion is that of the three plays published as joint productions during Fletcher's life, Beaumont either had the greater share, or that, through feelings of natural courtesy, Fletcher placed the name of his deceased associate before his own, and that future editors naturally followed the arrangement which they found to their hand. From all that can be gathered, it would appear that Beaumont possessed the deeper and more thoughtful genius; Fletcher the gayer and more idyllic. There is a strength as of granite rock in *The Maid's Tragedy*; there is a glad exuberant music, and a May-morning light and freshness in *The Faithful Shepherdess*, which Milton did not disdain to accept as a model in the lyrical portions of *Comus*, and of which the *Endymion* of Keats is but an echo. The plays of Beaumont and Fletcher never sound the deep sea of passion; they disport themselves, dolphin-like, on its surface. They are poets first and dramatists after; and indeed display but little power of serious and consistent characterisation, while they are much too fond of unnatural and violent situations. Morally, little can be said in their praise. Even that most delightful pastoral *The Faithful Shepherdess* is marred by deformities that interfere with its harmonious beauty. 'A spot,' says Charles Lamb, 'is on the face of this Diana. Nothing short of infatuation could have driven Fletcher upon mixing with this "blessedness" such an ugly deformity as Cloe, the wanton shepherdess!'

Weber's edition (1812) and Dyce's (11 vols. 1843-46) were superseded by Mr Bullen's great variorum edition (1904 *et seq.*, 11 vols.). Mr St Loe Strachey gave the best plays in the 'Mermaid' edition (2 vols. 1904). See A. W. Ward's *History of English Dramatic Literature* (2 vols. 1875); G. C. Macaulay's *Francis Beaumont* (1883); C. M. Gayley, *Francis Beaumont* (1914); Swinburne, *Contemporaries of Shakespeare* (1919); and the edition of the works by Glover and Waller (10 vols. 1905-12).

Beaumont, SIR GEORGE HOWLAND, landscape painter and patron of art and artists, was born at Stonehall, Dunmow, Essex, 6th November 1753, and studied at Eton and New College, Oxford. He was an intimate friend of Sir Joshua Reynolds; entertained Wordsworth at his house of Coleorton, in Leicestershire, where Scott, Rogers, and Byron met; befriended Coleridge and the painters Wilkie, Haydon, and Landseer; and presented his valuable collection of pictures to the National Gallery. He died 7th February 1827.

Beaumont, JEAN BAPTISTE ÉLIE DE, born in 1798 at Canon, in Calvados, taught geology in the Ecole des Mines and Collège de France, was elected to the Academy in 1835, and became in 1856 its perpetual secretary. He died 22d September 1874. With Dufrénoy he prepared a great geological map of France (1840; 2d ed. 1855). See MOUNTAINS.

Beaumont, SIR JOHN, baronet (1582-1628), elder brother of the dramatist. Grosart edited his *Bosworth Field* and other poems (1869).

Beaumontague is a composition of iron borings, brimstone, pitch, sal-ammoniac, rosin, and beeswax, which is used to fill up cracks and flaws in an iron casting, to give an appearance of solidity.

Beaune, a well-built town in the French department Côte d'Or, 23 miles SSW. of Dijon by rail, with a fine parish church, Notre Dame (13th century); a splendid hospital, founded in 1443 by Nicholas Rollin; and a bronze statue (1849) of Monge the mathematician. It manufactures serges, woollen cloth, and cutlery, and is a chief seat of the Burgundy wine trade, Beaune giving name to

one of the best Burgundies. During the Franco-German war in 1870 the town was several times occupied by the Germans. Pop. 10,000.

Beaune, FLORIMOND DE, a mathematician and friend of Descartes, born in 1601 at Blois, in France, served as a soldier, and died at his native place in 1652. His labours and discoveries contributed greatly to the improvement of the modern analytical geometry first introduced by Descartes. He is well known through 'Beaune's Problem,' solved with the help of the integral calculus by Jean Bernouilli in 1693, which turns on the determination of the nature of a curved line from a property of its tangent.

Beauregard, PIERRE GUSTAVE TOUTANT, Confederate general, was born in 1818, near New Orleans, graduated at West Point in 1838, served with distinction in the Mexican War, and after its close superintended the engineering works on the Lower Mississippi and the Gulf of Mexico. He joined the secession with his native state, and was appointed by the Confederate government to the command at Charleston, S.C., where, April 12, 1861, he commenced the war by the bombardment of Fort Sumter. He was virtually in command at the first battle of Bull Run, July 21, 1861; and sent to the west in the spring of 1862 as second to General A. S. Johnston, he succeeded to the command when the latter was killed in the first day's battle of Shiloh or Pittsburg Landing. Defeated on the second day's fighting, he retreated to Corinth, Miss., where he reorganised his division; but on the approach of the Union troops he evacuated the place, and was superseded by General Bragg. After a period of inactivity he was placed (1864) in command of the military division of the west, but failed to check Sherman's march to the sea. After the war, he was president of a railway, and manager of the Louisiana State Lottery. He died 21st February 1893.

Beausobre, ISAAC DE, Huguenot preacher and writer, was born at Niort, in Poitou, in 1659, studied theology at Saumur, and after his ordination had charge of a church at Châtillon-sur-Indre. The revocation of the Edict of Nantes, in 1685, obliged him to flee to Holland. In 1694 he went to Berlin, became chaplain of a French Protestant church there, and councillor of the royal consistory. Among his works were an *Essai critique de l'Histoire de Manichée et du Manichéisme* (1734-9), which Gibbon characterises as a rich treasury of facts and opinions; and along with M. Lenfant, a translation of the New Testament, with notes. He was a chief contributor to the voluminous *Bibliothèque Allemande*. He died at Berlin in 1738.

Beauty. See *ÆSTHETICS*, ART.

Beauvais, a town of France, capital of the département Oise, situated in the valley of the Thérain, 55 miles NNW. of Paris. Among several fine buildings the most noteworthy is the unfinished cathedral, begun in 1225, the choir of which, 153 feet high, is the loftiest as well as one of the finest specimens of Gothic in France. The industries include the weaving of Gobelin tapestries (since 1664), and the manufacture of cotton, woollen cloths, shawls, carpets, and toys. Population, 20,000. Beauvais was known by the Romans as *Cesaromagus*, afterwards as *Bellovacum*. In 1472 it was besieged by Charles the Bold of Burgundy, with an army of 80,000 men, when the women of Beauvais, under the leadership of the heroine Jeanne Hachette, displayed remarkable valour. The standard which the Burgundians had planted on the wall was torn down by Jeanne, and borne off by her in triumph. The banner is borne every year by young girls in a procession, and a statue of Jeanne was erected in 1851.

Beaver (*Castor*), a familiar rodent mammal, allied to squirrels and marmots, and represented by a single widely distributed species (*Castor fiber* or *canadensis*). It is widely known for its aquatic habit, its sagacious architectural devices, its glossy fur, and its fatty castoreum glands.

Form and Structure.—The beaver is usually about 2½ feet in length, and is thus hardly surpassed by any other rodent except the Capybara (q.v.). It stands rather under a foot in height, and the broad, flat, scaly tail is about 10 inches long. The body is plump, the back arched, the neck thick, the hind-feet webbed, and all the digits clawed. The strong wrist has an accessory bone. The fur varies considerably in colour, but is usually reddish-brown above, and lighter or grayish below. The short head runs out into a naked muzzle; the external ears are short and scaly, and admit of being folded, so as almost to shut the opening; the eyes are small; and the nostrils closable. The skull is massive, with marked ridges for fixing the muscles which work the jaws, and both size and ridges increase throughout life. The two front teeth on either jaw are like those of other rodents, wearing away more rapidly behind so as to leave a sharp enamelled chisel edge. They have a bright orange colour. They grow as usual from persisting pulps, so that what is worn away in gnawing is continually being replaced at the root. The four grinding teeth on each side of each jaw are nearly equal to one another, and exhibit two or three infoldings of the enamel coating. The stomach has near its commencement a peculiar glandular structure; the external relations of anal and urinogenital apertures resemble those of marsupials; and the male bears on its groin a pair of glands which secrete a substance known as *Castoreum*.

Distribution.—The beaver, though represented only by a single species, is widely distributed in the northern parts of both eastern and western hemispheres. It is rapidly disappearing from countries where it previously flourished, being now, for instance, extinct in Britain, and apparently also in Scandinavia. An attempt has been made to reintroduce it in Bute. Isolated colonies of beavers are still to be seen where they have been protected from molestation on the Elbe and a few other rivers in Germany and Austria; but they can hardly be said to be really at home in Europe except in Russia and Poland, and 'especially on the streams of the Ural Mountains, and those emptying into the Caspian Sea.' They are also abundant in Siberia. The American beaver, which is probably only a variety, and not a distinct species, is found to the west of the Mississippi, between Alaska and Mexico, and more sparsely to the east of the same river, to the south of the Great Lakes, in the Maine and Adirondack wildernesses, and yet more sparsely southward to Alabama and Mississippi. They are also frequent in some parts of Virginia and Pennsylvania (see Heilprin, *Distribution of Animals*, International Science Series). Several extinct species of beaver have been dug up from Miocene and Pliocene strata. *Castoroides ohioensis* was an allied giant rodent about as big as a black bear. Another large extinct rodent, which Owen described under the title 'Trogotherium,' is regarded by some as a giant beaver.

Habits.—Beavers are well known to be aquatic animals, and are never found far away from river or lake. Their webbed hind-feet make them capital swimmers. They also dive well though noisily, and can remain two minutes under water. They feed mainly on the bark of trees, such as willows, magnolias, poplars, and birches, but also on the roots of the water-lily and other plants, and

on their inland excursions during the warm season on fruits, corn, and the like. They often sit on their hind-feet and tail, eating with their fore-paws like squirrels. They are, however, pre-eminently bark-eaters, and large quantities of wood are stored up in the autumn for winter use. When the streams are frozen, they may remain for as long as a fortnight comfortably provided with supplies within their burrows. Most of the beavers' active life is during the night, except when floods force them to abandon their homes. They may be readily tamed, but cannot of course be kept in wooden houses. They may be seen in the London Zoological Gardens, and occasionally in aquariums.

Family-life.—Beavers are social animals; a family of about half a dozen is frequently found within a single house, and where food is abundant and the locality secluded, a large number of families occur congregated in a community. The young beavers leave the parent house in the summer of their third year, find mates for themselves, and establish new homesteads. When increase of population brings about difficulties of subsistence, a migration takes place, some going up and others down the stream. The old houses are never left vacant, however, but are simply transferred by the emigrants to some related new couple. Isolated males or terriers, apparently expelled from a colony for laziness or misbehaviour, are often found living alone.

Homes.—The simplest beaver home is merely a burrow, and when their tenure seems insecure, as in populous countries, the beavers may remain contented with this mode of life. These burrows open outwards under the water, and are thus effectively concealed. Mr L. H. Morgan, in his work on the American beaver, regards the burrow as the primitive and normal residence from which 'in the progress of experience, by a process of natural suggestion,' the more elaborate homes have been gradually evolved. Beaver architecture, as well as human, has had its history. Above the burrow a surface-pile of sticks is often found, perhaps to keep the snow loose enough overhead to admit air, and from these ventilating piles 'it is but a step to a lodge with its chamber above ground, and the previous burrow as an entrance from the water.' 'A burrow accidentally broken through at its upper end, and repaired with a covering of sticks and earth, would lead to a lodge above ground, and thus inaugurate a beaver-lodge out of a broken burrow.'

The Lodge.—However it may have arisen, the so-called beaver-lodge is a marvellous structure. Three distinct kinds can be distinguished in adaptation to different localities. The island-lodge is constructed on a small island in the pond or dam. It consists of a central chamber, with its floor a little above the level of the water, and with two entrances. One of these—the 'wood entrance'—is a straight incline rising from the water, and opening neatly into the floor of the hut. Up this the pieces of wood used for winter food are passed. The other approach—the 'beaver entrance'—is more abrupt in its descent to the water, and often tortuous in its course. Both approaches, which are often many feet in length, are neatly lined and finished off, especially where they open into the central chamber. The lodge itself is an oven-shaped house of sticks, grass, and moss, woven together and plastered with mud, increasing gradually in size with year after year of repair and elaboration. They are not only comfortable, but efficiently protective against beasts of prey. The room inside may measure 8 feet in diameter, and 2 or 3 feet in height. The floor is very comfortably carpeted with bark, grass, and wood-chips, and

there are sometimes special store-rooms adjoining. The entrances open into a specially deep moat surrounding the home, and as this is too deep to freeze readily, the inmates are not apt to be imprisoned even by very keen frost. Another kind



Beavers and Beaver-lodge.

of lodge is built on the bank of a stream or pond, either a short way back from the edge, or partly hanging over, with its front wall built up from the bottom of the pond. A third type—the so-called 'lake-lodges'—are built on the shelving shores of lakes, with a large part of the hut built out upon the water. The various forms of house, all apparently modifications of the primitive burrow, are of much interest, as illustrating the beaver's power of adapting its constructive powers to different local conditions. Mr Morgan also directs attention to the 'beaver-slides' or cuttings seen on the Upper Missouri, where the banks are too vertical to admit of the ordinary construction without some previous surface-work. In certain localities—for instance, in California—the animals have either relapsed from their ordinary architectural labours, or have never fully developed the constructive habit. Hunters often break into the lodges so as to drive the beavers into the holes or burrows.

Wood-cutting.—Some of the most interesting habits of beavers are connected with the way in which they procure and store their food-material. That they are bark-eaters has been already noticed, and it is an equally familiar fact that in order to procure this they cut down trees by gnawing a ring round the base. This they cut all round, but more towards the side nearest the water, so that the tree may fall as conveniently as possible. They can cut down a tree 10 inches or so in diameter. The smaller branches with more palatable bark are cut off in the same way, and cut into lengths convenient for transport and storage. The heavier pieces are ingeniously rolled along, often for a considerable distance, to the water-edge. Sometimes the tree is near enough to fall at once into the water, and is simply left till required, but such a convenient supply is soon exhausted. When a block has been rolled to the water-edge it is floated out to the lodge, and either anchored by means of brushwood stuck into the bottom of the pond, or sunk to the mouth of the 'wood entrance,' and conveyed up into the lodge. Barked branches from which the nutritive portion has been eaten away, may be further used, as already indicated, for building the lodges.

Beaver-dams.—Yet more marvellous are the dams

by which beavers widen the area and increase the depth of water round about their homes. These vary in structure according to the nature of the locality. They are either made of sticks and poles, with a slight embankment of earth, not enough to prevent the surplus water flowing freely through, or they are constructed more firmly and solidly of mud, brushwood, and stones, with a special outlet on the ridge for the discharge of the overflow. Though beavers do not hammer in poles, nor use their tails as trowels, they exhibit marvellous ingenuity in the construction of their dams. The stones and mud are cleverly carried by the fore-paws, the burden being pressed against the chest; the curvature of the dam is adjusted to the direction of the current; a constant level of water is secured by modification of the outlet sluice; the wear is continually remedied by fresh building; auxiliary dams are constructed to all appearance simply for the purpose of breaking the flow of water in the main dam, and so on. Some of these dams have prodigious dimensions. Mr Morgan describes one structure '1530 feet in length, of which 530 feet in two sections is artificial, and the remainder natural bank, but worked here and there where depressions on the ground required raising by artificial means.'

Canals.—Mr Morgan has also discovered and described the construction of waterways or canals, which the beavers dig between their ponds and the sources of timber-supply. When the trees near the water are exhausted, and when the uneven character of the ground makes the rolling of the logs a difficult task, canals are cut for convenience of transport. In certain cases the construction of a big dam may bring the water-edge quite near enough the trees, but this is not always so. The construction of canals becomes as necessary as it is marvellous. They may be hundreds of feet long, increasing in length as the trees are gradually cut away, and are usually about a yard or more in breadth, and 3 feet or so deep. Sometimes, however, the ground rises suddenly at a certain distance from the pond, so that a continuous canal becomes impossible. In such a case an engineer constructing a canal would make a 'lock.' This is exactly the solution of the difficulty which has been arrived at by beavers. Mr Morgan describes a case where three water-collecting crescent-shaped dams have been made, at three successive sudden ascents of the ground, and the principle of locks ingeniously combined with that of collecting reservoirs. In another case the canal bifurcates at the foot of the woodland slope, and thus presents a maximum water-edge. Or again, these acute engineers have been observed to make a short-cut waterway across the ground inclosed in a loop of the river, so as to lessen considerably the distance of transport.

Geological Interest.—All this work of burrowing, timber-felling, dam-building, canal-cutting, carried on continuously by generation after generation of beavers, must in no inconsiderable way have affected the minuter features of a landscape. Agassiz has estimated the age of one of these beaver dams at a thousand years. As the result of beaver work, large tracts once covered with trees have become bare, and what was once dry meadow has been flooded with water. Acres of what once was forest land are represented now by peaty clearings, and still remain as 'beaver meadows' in countries from which the busy foresters have long since disappeared.

Practical Uses.—The beaver has for long been hunted for the sake of its fur, from which both hats and gloves were made. Chaucer speaks of a 'Flandrish bever hat' about 1386, and we have 'brown beaver gloves' in Dickens' *Sketches by Boz* (1836). An act of the English parliament, in

1638, prohibiting the use of any other material for hat-making, contributed to the rapid diminution of the number of beavers in the parts of North America from which their skins were then obtained (see HAT). During a great part of the 18th and the earlier part of the 19th century, the number of beaver skins annually exported from America appears to have been not less than 200,000. It is now greatly diminished, but is still large. From very ancient times the secretion of the gland, on the groin of male beavers, has been valued on account of its curative properties. So far as the beavers are concerned, the strong-smelling substance is apparently subsidiary to sexual attraction. Hunters are said to utilise it as bait for their traps. The so-called castoreum contains oily and resinous substances, along with a crystallisable component known as castorine, once largely employed in medicine as a nervous stimulant. Mythical stories are told of the way in which beavers throw themselves on their backs when pursued by hunters, so as to expose the wished-for glands, with a hint that their lives might be spared; according to the credulous they may even bite off the glands and leave them as a ransom. The oily flesh is said also to be esteemed by the trappers. The fat tail is a special delicacy, and the animal being popularly regarded as a fish, may be eaten during Lent.

Intelligence.—Enough has been said to show that the habits and labours of beavers exhibit more marks of sagacity than can possibly be the result of instinct alone. For they do much more than follow a hard-and-fast path of orderly and purposeful action—they can adapt their actions to varying conditions in a manner which can only be described as rationally intelligent. The Indians go further, and invest the beaver with immortality.

See L. H. Morgan, *The American Beaver and his Works* (1868); Harting, *British Animals Extinct within Historic Times* (1880); Romanes on *Animal Intelligence and on Mental Evolution in Animals* (1886); and Horace T. Martin's *Castorologia* (1892); E. Thompson Seton, *Life-histories of Northern Animals* (1910).

Beaver Dam, a city at the outlet of Beaver Lake, Wisconsin, U.S., 65 miles NW. of Milwaukee, in the centre of a fertile district, has flour-mills, cotton and woollen mills, iron-works, and machine-shops; pop. 8000.

Beaver Falls, a borough of Pennsylvania, U.S., near the junction of the Beaver River with the Ohio, 31 miles NW. of Pittsburg, in a region abounding in coal and natural gas, with manufactures of iron, steel, machinery, glass, and pottery; pop. 13,000.

Beaver Islands, a group of small islands in the south-east corner of Lake Michigan, 40 miles west of its outlet the Straits of Mackinac, with several lighthouses on them. Here the Mormons tried to make a settlement in 1846.

Beaver-rat. See HYDROMYS.

Beaver State. See OREGON.

Beaver-wood. See MAGNOLIA.

Bebe'e'rine, or BEBERINE, is an alkaloid obtained from the greenheart bark or *bebeeru* of British Guiana, sometimes used as a substitute for quinine; but it is not so powerful in its action as a tonic and febrifuge, and has not therefore come into popular use. Bebeerine is always prescribed in the form of sulphate, a dark amorphous substance, obtained in thin translucent laminæ by spreading the syrup solution on sheets of glass, and allowing it to dry. See GREENHEART.

Bebek, a lovely bay on the European side of the Bosphorus, with a palace, known as the *Humayunabad*, and built in 1725. Here are an American school, and a college of the French order of Lazarists.

Bebel, FERDINAND AUGUST (1840-1913), social democrat, born at Cologne, came in 1860 to Leipzig, where four years later he established himself as a master turner. As an orator, writer, and member of the Reichstag he was an influential representative of Socialism, his popularity being only increased by his imprisonment more than once. He wrote much on the Socialist movement, on the peasants' war, on the status of women, on Sunday labour, and an autobiography (1910).

Bec Abbey, the ruins of which are at Bec-Hellouin, Normandy, 2½ miles from Brionne, was at the height of its fame as a great Benedictine monastery in the middle of the 11th century, when the famous Lanfranc was prior. His fame as a scholar had made it one of the most renowned seats of learning in Western Europe, students flocked thither from all parts, and gifts were bestowed upon it by the great men of Normandy. The great Anselm, entering it in 1060, was abbot from 1078 to 1093, when he succeeded Lanfranc in the see of Canterbury.

Beccafico (*Sylvia hortensis*, or *Curruca hortensis*), a little bird of the family of the Sylviadæ, or Warblers (q.v.), sometimes called the Petty-chaps, and sometimes the Garden Warbler, rather rare in Britain, but abundant in some of the more southern parts of Europe, and in great demand for the table in Italy, its flesh being regarded as of peculiar delicacy. It is a mere summer bird of passage, however, not only in Britain, but even in the south of Europe. The upper parts are mostly of a brown colour, the lower parts whitish. It is a bird of very pleasing song. Beccafico is an Italian name signifying 'fig-pecker,' and is sometimes extended to other birds of the same family used for the table.

Beccamoschino (Ital., 'fly-catcher,' *Sylvia cisticola*), a little bird of the family of Warblers, found in Italy. It is remarkable for its nest, which resembles that of the tailor-birds, and is usually placed in a bush with long leaves, which are neatly sewed together with some kind of vegetable fibre so as to form roof and floor.

Beccaria, CESARE, MARCHESE DE BECCARIA-BONESANA, a political and philanthropic writer, was born at Milan, March 15, 1735 (or in 1738). His opinions were formed by study of the French encyclopædists and Montesquieu. His chief work was his *Dei Delitti e delle Pene* ('On Crimes and Punishments'), first published anonymously at Monaco in 1764, in which he argues against the severities and abuses of criminal law, especially capital punishment and torture. The work became extremely popular, and was translated into all the European languages. It was hailed with enthusiasm by the French school, and commentaries were published by Voltaire and Diderot. A translation of it, with a life of Beccaria, was published by J. A. Farren in 1880. It is marked by eloquence, sensibility, and lively power of imagination. Kant unfairly accuses the author of an affected humanity, though it must be admitted that the German philosopher has exposed the invalidity of some of the arguments brought forward. On the whole, however, the work of Beccaria is acknowledged to have done great good, and the subsequent reforms in the penal code of European nations have generally taken the direction he has pointed out. He was among the first to advocate the beneficial influence of education in lessening crime. Both his arguments and his popularity made him many enemies, but their malice was frustrated by the efforts of Count Firmian, the Austrian governor of Lombardy, a man of liberal and enlightened sentiments. In 1768 Beccaria was appointed professor of Political

Philosophy at Milan, and achieved great success as a lecturer. In 1791 he was made a member of the board for the reform of the judicial code, and had the triumph of seeing several of his abused suggestions adopted. He died of apoplexy, November 28, 1794.—GIACOMO BATTISTA BECCARIA (1716-81) from 1748 was professor of Physics at Turin, and did much to forward the science of electricity, though himself he made no important discovery.

Beccles, a Suffolk market-town, on the Waveney, 8 miles W. of Lowestoft. It has a fine church with a detached belfry, a good grammar-school, and large printing-works. Pop. 7000.

Bec-fin, the common French name for different species of birds of the family Sylviadæ, or Warblers (q.v.).

Bêche de Mer. See TREPANG.

Becher, JOHANN JOACHIM, chemist, was born at Spire in 1635. He acquired an extensive knowledge of medicine, physics, and chemistry, and became professor at Mainz. He subsequently lived at Vienna, Munich, Würzburg, Haarlem, and finally London, where he died in 1682. He was accused of charlatanism, but unquestionably he rendered important services to chemistry. His *Physica Subterranea* (1669) was the first attempt made to bring physics and chemistry into close relation. He began to construct a theory of chemistry, and investigated the process of combustion. In this and his other works (including *Institutiones Chymicæ*, 1662) lies the first germ of Stahl's phlogistic theory.

Bechuanaland, an extensive tract in South Africa, inhabited by the Bechuanas, extending from 28° S. lat. to the Zambesi, and from South-west Africa to the Transvaal and Matabeleland; besides, the Bechuanas also still occupy a portion of the Transvaal. The territory of Bechuanaland was declared to be within the British sphere in 1885; the portion to the south of the river Molopo, British Bechuanaland, was made into a crown colony in 1885, and in 1895 was incorporated with the Cape Colony; this has an area of 51,500 sq. m. (larger than England without Wales), and a population of about 100,000—20,000 being whites. The protectorate beyond has an area of 275,000 sq. m.; that is, it is almost as large as the Cape Province itself, and is administered by its own kings or chiefs, with the help of a resident commissioner at Mafeking in British Bechuanaland, representing the king of Britain. Of the native tribes the most important are the Bamangwato. Pop. 153,000.

Bechuanaland is a portion of an elevated plateau 4000 to 5000 feet above the level of the sea, and though so near the tropics, is suitable for the British race. In winter there are sharp frosts, and snow falls in some years. The rains fall in summer, and then only the rivers are full. It is an excellent country for cattle; sheep thrive in some parts, and there are extensive tracts available for corn-lands; but it is not a wheat country on account of the summer rains. Though apparently subject to droughts, it is not more so than the Cape Province, and the greater portion will be available for farming operations when the necessary dams have been constructed. There are extensive forests to the north-east, and to the west the Kalahari Desert, which only requires wells dug to make it habitable. Cattle-rearing and the production of mealies and Kafir corn are the chief industries; gold is mined. Diamonds have also been found. The railway connecting Cape Town with Rhodesia, &c., traverses British Bechuanaland and the protectorate.

Education is provided with government assistance in the schools of the London Missionary Society and the Dutch Reformed Church. The Bechuanas are a black race, possessing a language in common

with the Bantu (q.v.) races of South Africa, extending as far north as the equator. Their ancestors are said to have come from the north, and, progressing south-west, met the Hottentots from the Cape of Good Hope journeying north. The Bechuanas have divided up within modern times, and comprise the Bahurutse, Bamangwato, Bakwena, Bangwaketse, Barolongs, Batlapins, and Batlars. Each tribe has an animal as an emblem or heraldic sign, which it is said they hold in esteem (see TOTEMISM). They were from 1832 at enmity with the Matabele, and later the Transvaal Boers on one pretext or another endeavoured to occupy their country. During the native risings in 1878 the Bechuanas invaded Griqualand West, and were in turn subdued by British volunteers as far as the Molopo. When the British government withdrew from Bechuanaland in 1880, the natives, being helpless, were left to the mercy of the Boers of the Transvaal, whose harsh treatment in 1882 and 1883 led to the Bechuanaland expedition in 1884. At the beginning of the 19th century the Bechuanas were further in advance in civilisation than other nations of South Africa, and they are still ahead in this respect. All important matters are decided in the public assembly of the freemen of the town, but matters are previously arranged between the chief and headmen, the chiefs exercising real control only by personal influence and adroitness. The natives pay a hut-tax. The protectorate was early included in the South African Customs Union. The short-lived Boer republics of Stellaland, on the Transvaal frontier, with Vryburg for capital, and Goshen farther north (1882-84), were broken up by Sir Charles Warren's expedition of 1884.

See Mackenzie's *Austral Africa* (1887), and his *Life by W. D. Mackenzie* (1902); Hepburn's *Twenty Years in Kham's Country* (1895); Sir H. H. Johnston's *Colonisation of Africa* (1899); and books named at CAPE OF GOOD HOPE.

Beckenham, an urban district of Kent, adjoining the county of London; pop. 33,000.

Becker, KARL FERDINAND, German philologist, was born near Treves in 1775, and in 1815 settled as a physician at Offenbach. Here he educated his own children with such success that several families induced him to take charge of theirs, and thus his house was converted into an academy (1823), which he conducted till his death in 1849. He wrote an *Ausführliche Deutsche Grammatik* (1836-39), and several other valuable treatises on the German language.

Becker, KARL FERDINAND, a German musician, born at Leipzig in 1804, at the age of fourteen made his first public appearance as a pianist. In 1843 he was appointed professor of the Organ at the Leipzig Conservatorium. His compositions for the organ have much value, but he is best known as a writer on the history of music, and as an important contributor to German musical periodicals. His collection of *Chorals* (1831), and *Die Hausmusik* (1840), are highly valued. He died October 26, 1877.—See also BEKKER.

Becker, WILHELM ADOLF, born at Dresden in 1796, studied theology and philology at Leipzig, and became in 1842 professor of Archæology there. He died at Meissen, 30th September 1846. His lively fancy, aided by a thorough knowledge of the classic languages, enabled him to make a novel use of antiquity. In his *Charicles* (1840) he ventured to reproduce the social life of old Greece, and in his *Gallus* (1838) to give sketches of the Augustan age at Rome. His *Handbuch der Römischen Alterthümer* (1843-46) was, after his death, continued by Marquardt (vols. iii.-v. 1849-68).

Beckerath, HERMANN VON, a German politician, was born at Krefeld, Prussia, 13th December 1801. He made a considerable fortune as a banker, and in 1843 was elected representative of his native town in the provincial diet. Elected to the National Assembly at Frankfurt in 1848, he was appointed minister of finance, and shortly after called to Berlin to construct a cabinet; but in this he failed. He was a resolute advocate for German unity. In 1858 he was again elected a member of the Prussian second chamber; but declined the honour on account of failing health. He devoted his later years to the affairs of his native town, where he died 12th May 1870. See *Life by Kopstadt* (Brunswick, 1874).

Becket, THOMAS, Archbishop of Canterbury, was born in London in 1118 of Norman parentage, his father being a wealthy merchant. That his mother was a love-lorn Saracen is a pretty but wholly baseless tradition. Educated at Merton Priory and in the London schools, he was trained in knightly exercises at Pevensey Castle, next studied theology at Paris, and then, on his father's failure in business, was clerk for three years in a lawyer's office. About 1142 he entered the household of Theobald, Archbishop of Canterbury, who sent him to study canonical jurisprudence at Bologna and Auxerre, heaped preferments on him, including the archdeaconry of Canterbury (1154), and employed him in several important missions. At the papal court in 1152 he had promoted the cause of Henry of Anjou against that of Stephen's son, Eustace; in 1155, the year after Henry's accession, he received the office of chancellor, and thus resuscitated the hopes of the English as the first Englishman born, since the Conquest, who had filled any high office. His duties as chancellor were numerous and burdensome, but he discharged them vigorously. So magnificently liberal was he in his hospitality, that Henry himself did not live in a manner more sumptuous. He fought like any knight in the war with Toulouse (1159), and would seem in everything to have regarded himself as a mere layman, though he held deacon's orders. The change, then, was all the more sudden when in 1162 he was created Archbishop of Canterbury, an office which, as it then involved the abbacy of the cathedral monastery, had never but twice before been held by any but a monk or canon-regular. He resigned the chancellorship, threw aside all his old courtly and luxurious habits, turned a rigid ascetic, showed his liberality only in charities, and in short became as zealous a servitor of the church as ever before of king or archbishop. He figured soon as a champion of her rights against all aggressions by the king and his courtiers, several nobles and other laymen being excommunicated for their alienation of church property. Henry II., who, like all the Norman kings, endeavoured to keep the clergy in subordination to the state, in 1164 convoked the nobility and clergy to a council at Clarendon (q.v.), where were adopted the so-called 'Constitutions,' or laws relative to the respective powers of church and state. To these, curtailing clerical immunities, the primate at first declared he would never consent; but afterwards, through the efforts of the nobles, some of the bishops, and, finally, of the pope himself, he was induced to give his unwilling approbation. Henry now began to perceive that Becket's notions and his own were utterly antagonistic, and clearly exhibited his hostility to the prelate, whereupon Becket tried to leave the country. For this offence Henry charged him with breach of allegiance, in a council held at Northampton, confiscated his goods, and sequestered the revenues of his see. A claim was also made on him for not less than 44,000 marks, as the balance due by him to the crown when he

ceased to be chancellor. Becket appealed to the pope, and next day leaving Northampton in disguise, escaped to France. He spent two years in retirement at the Cistercian abbey of Pontigny in Burgundy; and then, the pope seeming disposed to take up his cause, he went to Rome, and pleaded personally before his holiness, who reinstated him in the see of Canterbury. Becket now returned to France, and thence he wrote angry letters to the English bishops, threatening them with excommunication. Several efforts were made to reconcile him with Henry, which, however, proved futile; but at length in 1170 an agreement was patched up at Freteval, on the borders of Touraine. The result was that Becket returned to England, entering Canterbury amid the rejoicings of the people, who were unquestionably proud of him, and regarded him—whether wisely or not is another question—as a shield from the oppressions of the nobility. Fresh quarrels soon broke out; excommunications were renewed; and Henry at last exclaimed: ‘Of the cowards that eat my bread, is there none will rid me of this turbulent priest?’ Four knights—Fitzurse, Tracy, Brito, and Morville—overheard the hasty words; and, quitting Normandy by separate ways, on the evening of 29th December 1170 entered Canterbury cathedral, and slew the archbishop before the altar of St Benedict, in the north transept. Henry was compelled to make heavy concessions to avoid the ban of excommunication. The murderers, having repaired to Rome as penitents, were sent on a pilgrimage to Palestine; and, two years after his death, Becket was canonised, and the anniversary of his death set apart as the yearly festival of St Thomas of Canterbury. In 1220 his bones were raised from the grave in the crypt where they had been hastily buried two days after his murder, and were deposited in a splendid shrine in the Trinity Chapel, which for three centuries continued to be the object of one of the great pilgrimages of Christendom, and which still lives in English literature in connection with Chaucer’s *Canterbury Tales*. At the Reformation, Henry VIII. despoiled the shrine, erased Becket’s name from the calendar, and ordered his bones to be burnt and scattered to the winds. Becket was violent, impetuous, stubborn, resentful of injuries, but in his great quarrel we need not doubt that he believed himself to be standing for the laws of God against the wickedness of men. He died not so much for maintaining that churchmen should not plead or be tried in the king’s courts, but only in the church courts, as because he refused to take off a sentence of excommunication at the command of the men who threatened, and took, his life; maintaining thus the freedom of the church as he and Hildebrand understood it. No canonisation was more popular, and miracles at his shrine abounded; the people sympathised with his defence of the church, but glorified him mainly for a brave stand against the tyranny of king and nobles. That the question of English against Norman entered into the case is probably quite unhistorical.

See Robertson and Shephard’s *Materials for the History of Becket* (Rolls Series, 1875–85); Stanley’s *Memorials of Canterbury*; Freeman’s *Historical Essays*; Hook’s *Archbishops of Canterbury*; Stubbs in the *Constitutional History*; J. B. Adams in vol. ii. of the *Polit. Hist. of England* (1905); and Lives by Morris (1885), Hutton (1889 and 1910), E. A. Abbott (1898), and R. H. Benson (1908).

Beckford, WILLIAM, born in Jamaica, 19th December 1709, and educated at Westminster, became member for the city of London (1753), and twice Lord Mayor. As such he showed himself a doughty Whig. A petition from the corporation of London, presented by him, March 1770, to George III., being treated as unconstitutional, he in May presented a firm and dignified remonstrance. The

king’s answer being still curt and unconciliatory, Beckford, after asking leave to speak, proceeded to argue the point with the king. His daring, or a cold, cost him his life, for just four weeks later he died in London, 21st June 1770. There is a notable statue of him in Guildhall.

Beckford, WILLIAM, son of William Beckford (q.v.), was born at Fonthill, Wiltshire, 1st October 1760. On his father’s death in 1770 he inherited an enormous property, consisting for the main part of Fonthill and of estates in Jamaica, and estimated at a million of money, upwards of £100,000 a year. Young Beckford evinced unusual intellectual precocity; for in his seventeenth year he composed a satirical essay, entitled *Biographical Memoirs of Extraordinary Painters*, in which he did not spare living artists, and assailed the cant of criticism with the polished weapon of wit. In 1777 he visited the Continent, and met Voltaire at Paris. Three years thereafter he started on a grand Continental tour, and spent twelve months in rambling through Flanders, Germany, and Italy, revisiting the last in 1782. In 1783 he married Lady Margaret Gordon, daughter of Charles, fourth Earl of Aboyne, and next year entered parliament for Wells. In 1787 *Vathek* appeared in French. Beckford asserts that he wrote it at twenty-two years of age, at a single sitting. ‘It took me,’ he says, ‘three days and two nights of hard labour. I never took off my clothes the whole time. The severe application made me very ill.’ Nevertheless it is proved that he worked at it for some months. An English version of *Vathek*, made from an unpublished manuscript, had been issued in 1786. Beckford professed not to know the translator (understood to have been Samuel Henley, D.D.), but thought his work well done. In 1787 Beckford sought distraction from the loss of his young wife, a year before, in a visit to Portugal. In 1790 he sat for Hindon; in 1794 he accepted the Chiltern Hundreds, and again left England. Revisiting Portugal, he purchased an estate near Cintra, and occupied for a time that ‘paradise’ which Byron commemorates in *Childe Harold*. He returned to England in 1796; and in 1801 the splendid furniture of Fonthill was sold by auction, and the next year his valuable collection of pictures was disposed of in London. These dispersions were no sooner made than he began a new collection of books, pictures, furniture, curiosities, and proceeded to erect a new building at Fonthill, the most prominent feature of which was a tower 278 feet high. Beckford resided at Fonthill till 1822, when in one of those strange vagaries of feeling of which his life was so full, he sold the estate and house, with all its rare and fargathered contents, to Colonel Farquhar for £330,000. Three years later the great tower, which had been raised on an insecure foundation, came to the ground. On the sale of Fonthill, Beckford removed to Bath, and immediately proceeded to erect another lofty tower. While residing there, he did not mingle in Bath society, and the most improbable stories concerning the rich and morose genius in their neighbourhood were circulated among the citizens. During all his life, Beckford was a hard-working student, devoured by a passion for books. Some of his purchases were perfectly imperial in their way. He bought Gibbon’s library at Lausanne, to amuse himself when he happened to be in that neighbourhood. He went there; read in the fierce way that he wrote, three days and two nights at a sitting; grew weary of his purchase; and handed it over to his physician, Dr Scholl. Up till 1834 he had published nothing since *Vathek*, but in that year the literary silence of half a century was broken by the appearance of a series of letters, entitled *Italy, with Sketches of Spain and Portugal*, in two volumes. In the same year he republished

his *Memoirs of Extraordinary Painters*; and in 1835 he issued another volume, entitled *Recollections of an Excursion to the Monasteries of Alcobaca and Batalha*, made in June 1794. From the period of this last publication till his death, which took place on the 2d of May 1844, he lived in the deepest retirement. Beckford, since the publication of his Arabian tale, has been a power in English literature. His wit, his sarcasm, his power of graphic description, may be seen in his journal and letters; and his higher faculties of imaginative conception reign in the passages that shadow forth in gloom and glory the 'Hall of Eblis.' His library was sold by his great-grandson, the twelfth Duke of Hamilton, in 1882-83.

See the reprint of *Vathek* by Mallarmé (Paris, 1876), and the English edition by Garnett (1893); the *Life* by Cyrus Redding (1858); Whibley in *The Pageantry of Life* (1900); the *Life and Letters* of Beckford by Lewis Melville (1910); and *The Episodes of Vathek*, three tales designed for the original edition by Beckford, but first published by Marzials and Melville in 1912.

Beckmann, JOHANN, born in 1739 in Hanover, was in 1766 appointed professor of Philosophy, and in 1770 of Political Economy, at Göttingen, where he died, February 4, 1811. In Germany he was the first scientific writer on agriculture. In England he is known by his *History of Inventions* (5 vols. 1780-1805; Eng. trans. 1814).

Beckwith, J. C. See WALDENSES.

Beckx, PETER JOHN, general of the Jesuits, was born at Sichein, in Belgium, February 8, 1795. He was early employed on various delicate missions, and was for many years confessor to the Duke of Anhalt-Köthen. In 1847 he was appointed procurator for the province of Austria, and on the expulsion of the society in 1848, returned to Belgium, and became rector of the college at Louvain. He was named provincial of Austria in 1852, and as head of his order from 1853, displayed an ability and tact that did much to advance the status of Jesuits in non-Catholic countries. He died at Rome, March 4, 1887.

Becquerel, ANTOINE CÉSAR, a distinguished French physicist, was born in 1788, at Châtillon-sur-Loing, in the department of Loiret. In 1808 he entered the French army as an officer of engineers, and served with distinction in Spain. On his return to France, he was appointed inspector of the *École Polytechnique*; was attached to the general staff of the army in 1814, but at the peace of 1815 retired from the service. His researches and discoveries were mainly in the fields of electricity and magnetism, and he may fairly be regarded as one of the creators of electrochemistry. His labours in this branch of science opened to him in 1829 the doors of the Académie des Sciences. Among his works were the *Traité de l'Électricité et du Magnétisme* (7 vols. 1834-40); *Éléments d'Électrochimie* (1843); *Traité de Physique*; *Éléments de Physique terrestre et de Météorologie* (1847). He died on the 19th January 1878.—His son, **ALEXANDRE EDMOND**, also an eminent physicist, was born at Paris, 24th March 1820. He was decorated with the cross of the Legion of Honour in 1851; and was appointed professor of Physics in the *Conservatoire des Arts et Métiers*, in 1853. He died 13th May 1891. Besides his conjoint labours with his father, he made important researches on light, on phosphorescence, and on the conductivity and magnetic properties

of many substances.—His son, **ANTOINE HENRI** (1852-1908), was, even before he became professor at the *École Polytechnique*, recognised as one of the greatest physicists of his time. For the Becquerel Rays, see RADIUM.

Becse, a town of Yugoslavia, on the Theiss, and 45 miles S. of Szegedin; pop. 20,000.

Becskerék (NAGY), a town of Yugoslavia (till 1920 Hungary), on the Bega Canal, 45 miles SW. of Temesvár by rail; pop. 26,000.

Bed, an article of furniture made up of diverse materials on which persons rest and sleep. In ancient Palestine the bed seems to have been a simple kind of couch for reclining on during the day, and sleeping on at night, and readily removable from place to place, as is referred to in different parts of Scripture. About the heat of the day, Ishbosheth lay on his bed at noon (2 Sam. iv. 5). In receiving visitors, the king bowed himself upon the bed (1 Kings, i. 47). Jesus saith, 'Take up thy bed, and go unto thine house' (Matt. ix. 6). Yet, in these early times, beds or couches must, in some instances, have been highly ornamented: thus, 'I have decked my bed with coverings of tapestry, with carved works, with fine linen of Egypt' (Prov. vii. 16). In Persia, even at the present day, every person sleeps on a rug or piece of carpet laid on the floor, or commonly, during the summer, laid on the flat roof of a house. The pillows are similar to those used in Europe, but rather larger. It is the custom in India, on the other hand, to sleep on a bed or couch raised on four feet, called a *charpoy*. In hot climates few bed-clothes are used—there being in general only a single sheet employed; care is taken, however, to use mosquito-curtains, without which rest would be impracticable. See MOSQUITO.

Greek and Roman Beds.—Representations of ancient Greek beds and sofas are found on painted vases and on some pieces of sculpture. These beds plainly differed but little from the simpler modern forms, while the sofas or couches were in shape, in some cases at least, exactly like those now used. We are enabled to form a more perfect idea of ancient Roman beds than can be got from pictures and bas-reliefs. In the wonderful collection of Pompeian bronzes forming part of the great museum at Naples, there are three of these beds. They are partly of bronze and partly of wood, but the wooden portions, which were originally of walnut, have been restored. Fig. 1 shows one of these. It will be seen that it is of the couch form, and very

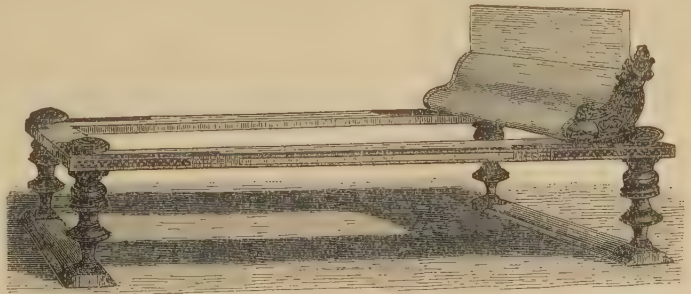


Fig. 1.—Ancient Roman Bed found at Pompeii.

elegant. Its length is 7 feet 6 inches, its breadth 4 feet, and its height 1 foot 5 inches. In addition to these an ancient trundle or truckle-bed was found at Pompeii in 1868; it is shown in the museum under one of the three larger bedsteads. The Etruscan Museum in the Vatican at Rome contains an ancient bronze bed on six feet, with a bottom

formed of strips of metal exactly like those put on brass and iron beds at the present time, only they are placed diagonally in the old example. In short, the bedsteads we now prefer are more closely like those made in Italy 2000 years ago than any which have been in use during the long interval.

In Homer's time the bedding even of the richer classes consisted of a long fibred woollen blanket or mattress, and that of the poor of a simple hide spread on the hard floor. Linen sheets were used as covers. Later on, when Greece had introduced more luxurious habits from Asia, mattresses stuffed with wool or feathers became common, and of the same materials pillows were made. The Romans also stuffed their bedding with wool as well as with the soft down of geese, swans, and other birds. Their blankets and sheets were sometimes elaborately ornamented with patterns in colours either woven or embroidered.

Medieval and later Beds.—In Anglo-Saxon times, ordinary beds appear to have been plain wooden benches fixed in recesses, and having sometimes at least curtains in front—a kind of bed not yet entirely obsolete in Scotland. The bedding consisted, no doubt, of a large sack filled with straw, together with a sheet or sheets and coverlet. Mr T. Wright, in his *Homes of Other Days*, gives an illustration of a Saxon double bed of this nature with curtains. He also gives two woodcuts, after drawings in the Harleian manuscript, No. 603, of two Saxon bedsteads, box-shaped, with short corner pillars terminating in balls, and with the head end like that of a couch, but rather higher. The sides of one have thin balusters, but in the other they are plain. It is believed that these bedsteads were only used by persons of rank. The same author gives two figures of Norman beds. One of these so far resembles the isolated Saxon bedsteads, but it has a high panelled foot-board, and the sleeper lies on a slope with an oval disc at his head. The second illustration shows that the tent-bed with a top frame and side curtains was now in use. Louandre's *Les Arts Somptueux* contains pictures of five beds, taken from a French illuminated manuscript of the 12th century. In these the bedstead takes the oblong form, with four short posts and balls, and much resembles the Anglo-Saxon ones referred to above. Except in the deep closed sides, and that in two of them the sleeper lies in a sloping position, these scarcely differ in general appearance from many plain modern beds; but at the top end there is a large flat disc, apparently swung on pivots, to enable the head to rest at any angle.

In the 13th century, beds were furnished much as at present, with a stuffed quilt, bolster, pillows, sheets, and coverlets. Among the rich, down was used; but feather-beds did not come into general use till the 15th century. All classes appear to have begun in the 13th century to take a pride in the appearance of the bed, while those who could furnished it with handsome curtains and coverings. In the 15th century the canopy, curtains, and other parts had together the general appearance of a modern half-tester or canopied bed; but the tester or back and the *celure* or roof were fixed to the wall and ceiling. In France especially from the 16th century till the Revolution the bed was a sumptuous object, and for state and ceremonial purposes it almost vied with the throne.

The large four-post bed was introduced in the 16th century, and continued in use till the middle of the 19th. Many of these beds, especially of the earlier time, were elaborately and beautifully carved, and furnished with rich hangings. Interesting examples of them are still preserved in old mansions and castles in England and on the Continent. The Great Bed of Ware, in Hertfordshire, now at Rye House, is of this age, and is one of the

curiosities of England. It is referred to in the *Twelfth Night* of Shakespeare. It measures 12 feet square (see fig. 2). A kind of camp-bed was also in use in the 16th century, which was carried about on journeys, and was frequently used in residences in place of a stationary bed. Some of

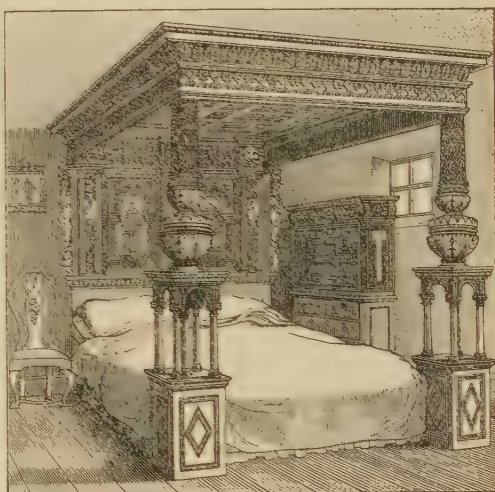


Fig. 2.—The Great Bed of Ware.

these beds were luxuriously decorated. Francis I. made a present to Henry VIII. of England of a rich camp-bed of crimson velvet, embroidered with bands of leaves in gold, and with fruit of large and small pearls, which had cost him 13,500 livres.

Modern Beds.—The heavy four-post bed, which was so long characteristic of a well-furnished English bedroom, is becoming a thing of the past. The comparatively recent and scarcely less massive half-tester bed, which suited so well for the display of the more handsome furniture-woods, has also gone out of fashion. Even the much lighter four-post tent-bed, or its later form without the curtained roof, called the French bed, that was so recently to be seen in nearly every well-to-do working-man's house in Great Britain, is fast disappearing.

The modern aim in the construction of beds is simplicity of form, freedom from encircling curtains, hangings, and all impediments to ventilation and circulation of air. To discourage the harbouring of insect pests and the lodgment of noxious bacteria is also an important consideration. The use of metal bedsteads, iron and brass, undoubtedly most effectively conduces to these purposes, and that fact, combined with the moderate price at which they can be produced, has led to the predominant adoption of metal as against wood for beds.

Most serviceable and cheap beds are formed of strong iron angle-bars dovetailed together at the four corners, having tubular corner posts with head and foot pieces of rod-iron, all painted in enamel-colour. Formerly the bed-bottom was made of laced hoop-iron, which in use gradually sagged in the middle; but now there are numerous woven wire devices employed which form at once spring-mattresses and are not liable to sag. More costly bedsteads are made in lacquered brass in elaborate designs enriched with inlays of oxidised silver and coloured stones.

The headquarters of the British metal bedstead industry is Birmingham, but Wolverhampton, London, Manchester, and Glasgow also share in the now huge industry, finding its outlets not only in

the United Kingdom, but in all British colonies and dependencies and in foreign markets.

Bed Furnishings.—An entire bed equipment is composed of diverse elements. The bed proper is either a bag of linen 'tick' filled with soft loose material or an upholstered mattress. The contents of the linen bag may be downs, feathers, rag-flock, or oaten chaff; but such bag beds are not now nearly so much used as in earlier days when feather beds were almost universal in the houses of the well-to-do, and chaff beds were in Scotland the common equipment of rural households. Mattresses are now, however, generally preferred, and these are made up of hair, wool, and rag-flock. The most comfortable and luxurious mattresses are made with an under-structure of steel springs upholstered with a covering of hair. Bolsters and pillows for head-rests are filled with downs or feathers. Sheets, generally of linen, but sometimes of cotton or wool, cover the bed and its occupant. Warmth for the sleeper is provided by woollen blankets (sometimes with a down quilt added), and in the day-time the surface is overspread with a coverlet (Fr. *couvre-lit*).

In Continental countries the bed is generally fitted for the use of a single person, and though more spacious structures fitted for two—sometimes more—are commonly found in the United Kingdom, the more healthful single bed is increasing in favour.

The use of filthy materials in the filling of cheap beds and the stuffing of mattresses became so grave a menace to public health early this century that legislative action to abate the evil became necessary. Accordingly the 'Rag-flock Act' was in 1911 passed by the British parliament, the principal provision of which was to prohibit the sale and use of rag-flock for bedding, &c., which contains more than 30 parts of chlorine per 100,000 parts of flock. The act, though not very satisfactory, has had the beneficial effect of bringing the flock industry under the supervision of sanitary authorities throughout the country.

Mats and Pillows in Warm Countries.—In most parts of Africa, and the tropical and subtropical islands of the Pacific Ocean, it is a common custom

from the roofs of tents or from trees. At least one form of the ancient Egyptian bedstead appears to have been like the one still common in that country, namely, a low frame formed of wicker-work of palm-sticks. Much more curious, however, is the pillow used in Egypt in ancient times, since it forms the type of many used at the present time in far-distant countries. These Egyptian pillows or head-rests were generally made of wood, but sometimes of alabaster or earthenware. Fig. 3, *c*, represents one of wood, from the Tombs of Thebes. The same kind of wooden pillow or support for the head is still found in Abyssinia, the delta of the Zambesi, and in that direction as far south as Swaziland. It is also used in the country around Lake Tanganyika, in Ashanti, and in other parts of Africa. Much the same form of head-rest is made in the Fiji Islands, in Tahiti, and in New Guinea; while in China and Japan we find a somewhat similar pillow of wood, lacquered it may be, with a small cylindrical cushion on the top. The preceding figures show several of these pillows.

The word *bed* is probably from the Indo-Germanic root *bhōdh* ('dig'), and thus originally applied to a dug-out sleeping-place. *Bed* in gardening may go back directly to the notion of digging, or may be an extension of the ordinary use.

In geology *bed* is synonymous, or nearly so, with *Stratum* (q.v.); and see GEOLOGY, also the articles BALA BEDS, BEMBRIDGE BEDS, MAESTRICHT BEDS, PURBECK, EOCENE, &c.

Bed-sores and *Bed of Justice* are the subjects of separate articles.

Bédarioux, a town of France, department of Hérault, situated on the river Orb, 27 miles NNW. of Béziers by rail; pop. 5000.

Bedawi. See BEDOUINS.

Bed-bug. See BUG.

Bedchamber, LORDS OF THE, or lords in waiting, officers in the British royal household, who wait in turn upon the sovereign's person. They are under the groom of the stole, who attends the king only on state occasions. There are also grooms of the bedchamber, or grooms in waiting, who take their turns of attendance. These offices in the reign of a queen are performed by ladies. Corresponding to the groom of the stole is the mistress of the robes, and to the lords and grooms in waiting are ladies of the bedchamber and bedchamber women. These offices are objects of high ambition, from the access they give to the person of the sovereign, and are for the most part filled by 'the prime nobility of England.' In 1839 the queen's refusal to part with the ladies of her bedchamber, on the occasion of a change in government, led to Sir Robert Peel's declining to form a ministry, and to Lord Melbourne's return to office. The incident was playfully called 'The Bedchamber Plot.' See HOUSEHOLD (THE KING'S OR QUEEN'S), and Mrs Armytage, *Old Court Customs and Modern Court Rule* (1883).

Beddgelert ('grave of Gelert'), a Carnarvonshire village, a great tourist centre, near Aberglaslyn Pass, 12 miles SE. of Carnarvon. The grave of the legendary hound of Llewellyn (see GELLERT) is marked by a few stones. The ascent of Snowdon is often made from this 'gem of Welsh villages,' which is the principal scene of Southey's *Madoc*.

Beddoe, JOHN (1826–1911), anthropologist, born at Bewdley, Worcestershire, was educated at Bridgnorth, University College, London, and Edinburgh University, graduating B.A. of London in 1851, and M.D. of Edinburgh in 1853. He served as a civil surgeon during the Crimean war, and afterwards established himself in practice at Clifton. He was the author of *Stature and Bulk of Man in the*

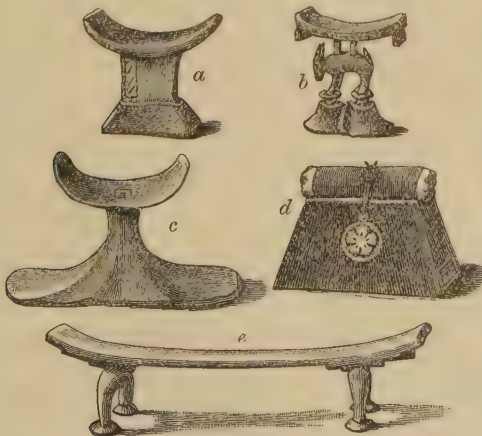


Fig. 3.—Various forms of Pillows :

a, pillow used by the natives of the Zambesi Delta; *b*, from Swaziland, South-east Africa; *c*, ancient wooden pillow from the Tombs of Thebes; *d*, Japanese lacquered wooden pillow with cushion; *e*, wooden pillow from Fiji Islands.

to sleep on mats of some vegetable fibre, but sometimes skins are used for this purpose. Many South American Indians sleep on hammocks suspended

British Isles (1870), *The Races of Britain* (1886), and other anthropological and ethnological works.

Beddoes, THOMAS, physician, born at Shifnal, Shropshire, in 1760, passed from Bridgnorth grammar-school to Pembroke College, Oxford, and afterwards studied medicine at Edinburgh and London. In 1788, after taking his M.D. at Oxford, he was appointed reader in chemistry there, but his sympathies with the French Revolution rendered his post so uncomfortable that he resigned it in 1792, and retiring into the country, wrote his work *On the Nature of Demonstrative Evidence*. Several patriotic pamphlets followed, and the *History of Isaac Jenkins*, in which he laid down, in a popular style, rules of sobriety, health, &c. for the working-classes. Of this work 40,000 copies were sold in a short time. He married Anna, sister of Maria Edgeworth. In 1798, after careful study of the use of artificial or medicated gases in the cure of diseases, especially consumption, aided by his father-in-law, Mr Edgeworth, and pecuniarily assisted by his friend, Thomas Wedgwood, he opened a 'pneumatic' hospital at Clifton. It did not succeed in its main object, which was to show that all diseases being referable to an undue proportion or deficiency of some elementary principle in the human organism, could be cured by breathing a medicated atmosphere; and Beddoes, whose zeal had abated, retired from it in 1801. He died 24th December 1808. The chief result of Beddoes' enterprise was the introduction to the world of Sir Humphry Davy, who was the superintendent of the institution, and who says of Beddoes: 'He had talents which would have exalted him to the pinnacle of philosophical eminence, if they had been applied with discretion;' and Southey wrote on hearing of his death: 'From Beddoes I hoped for more good to the human race than any other individual.' See the Life of Beddoes by Dr Stock (1811).

Beddoes, THOMAS LOVELL, eldest son of the above, and nephew of Maria Edgeworth, was born at Clifton, 20th July 1803. From Bath grammar-school he passed in 1817 to the Charterhouse, and thence in 1820 to Pembroke College, Oxford. In 1822 he published *The Bride's Tragedy*, which achieved a brilliant success. In 1825 he went to Göttingen to study medicine, and thenceforth led a strange wandering life as doctor and democrat, in Germany and Switzerland, with occasional visits to England. From 1825 he was engaged in the composition of a drama, *Death's Jest-book*, which, with his poems and a memoir by Kelsall, appeared in 1850-51. The story of his death by suicide at Basel (26th January 1849) was told for the first time in Mr Gosse's memoir prefixed to his edition of the *Poetical Works* (2 vols. 1890). The poems of Beddoes, almost all nominally dramatic, exhibit no power of characterisation, no ability in the conduct of a story; but the fullness of thought and image, the tone of music, and the depth of colour are marvellous.

Bede, or BÆDA, the VENERABLE, the greatest name in the ancient literature of England, was born in the neighbourhood of Monkwearmouth, in the county of Durham, about the year 673 A.D. He was educated under the care of the learned and liberal abbot, Benedict Biscop, and his successor, Ceolfrid, in the Benedictine abbey at Monkwearmouth, to which the young scholar came an orphan child in his seventh year. Ultimately he entered the monastery at Jarrow, an offshoot of the same foundation, and here he remained until his death. Here he took deacon's orders in his nineteenth year, and was ordained priest in his thirtieth, by John of Beverley, then Bishop of Hexham. In the shelter of his quiet and sacred retreat he devoted

himself to study, while he was diligent in observing the discipline of his order, as well as in the daily service of the monastery church. His industry was enormous, and he was continually employed in reading, writing, and teaching. Besides Latin and Greek, classical as well as patristic literature, he studied Hebrew, medicine, astronomy, and prosody. He wrote homilies, lives of saints, hymns (his English Death-song a valuable monument of the Northumbrian dialect), epigrams, works on chronology and grammar, and biblical commentaries. His calm and gentle spirit, the humanising character of his pursuits, and the holiness of his life present a striking contrast to the turbulent temper of his time. When near his end he translated St John's Gospel into English, dictating his version to his pupils. The well-known story of how he finished the last sentence of his version on the very day of his death casts a light on the serene and simple piety of his life. His brethren had all gone to the festival, and he was left alone with the scribe. 'Dearest master,' said the latter, 'there is one chapter wanting, and it is hard for thee to question thyself.' 'No, it is easy,' said he; 'take thy pen and write quickly.' When evening came, the young scribe said, 'There is yet one more sentence, dear master, to write out.' He answered, 'Write quickly.' Shortly after the boy said, 'Now it is finished.' 'Well,' said the aged saint, 'thou hast spoken truly "it is finished."' Then he bade them place him where he could look on the spot on which he was wont to kneel in prayer. Then he chanted the *Gloria Patri*, and as he uttered the words 'the Holy Ghost,' he breathed his last, and 'so passed to the kingdom in heaven,' on the day of the Feast of the Ascension, 26th May 735. He was buried in the monastery of Jarrow: long afterwards (in the middle of the 11th century) his bones were removed to Durham. His most valuable work is the *Historia Ecclesiastica Gentis Anglorum*, an ecclesiastical history of England, in five books, to which we are indebted for almost all our information on the ancient history of England down to 731 A.D. Bede gained the materials for this work partly from Roman writers, but chiefly from native chronicles and biographies, records and public documents, and oral and written communications from his contemporaries. It was translated into English not by King Alfred, but under his authority. At the end Bede gives a list of his thirty-seven works. His *De Sex Ætatibus Mundi* was an important book in chronology. 'First,' says Green, 'among English scholars, first among English theologians, first among English historians, it is in the monk of Jarrow that English literature strikes its roots. In the six hundred scholars who gathered round him for instruction, he is the father of our national education.' He is, moreover, the first English churchman whose books were accepted as standard works by the whole Catholic Church, and carried the fame of English learning throughout Western Christendom.

Among the editions of Bede's History may be noticed those printed at Strasburg in 1473-1500; those by Smith (1722), Stevenson (1838), Hussey (1846), Moberley (1869), and Holder (Freiburg, 1882); and the standard edition of the *Opera Historica* by C. Plummer (2 vols. 1896). The complete works were published in Paris (6 vols. folio, 1544-45), Basel (8 vols. folio, 1563), Cologne (1612 and 1638), London (12 vols. 1843-44) by Giles, and at Paris in Migne's *Patrologia* (xc.-xcv., 1844). The History was Englished by Stapleton (1655), Stevens (1723), Hurst (1814), Giles (1840), Stevenson (1852), Gidley (1870), and Sellar (1907). See Hodgkin in the *Polit. Hist. of Eng.* (vol. i. 1906), Stopford Brooke's *English Literature to the Norman Conquest* (1898), the short Life by G. F. Browne (1880; new ed. 1918), and Roger, *L'Enseignement Classique d'Ausone à Alcuin* (1905).

Bedeau, MARIE ALPHONSE, a French general, born near Nantes in 1804, entered the army in 1825. Sent in 1836 to Algeria, as commandant of a battalion he took part in most of the military operations, and in 1847 was for three months governor of Algeria. In 1848 he was commissioned by Marshal Bugeaud to suppress the February revolution in Paris, but failed. He took office under the Provisional Government, and was named vice-president of the Constituent Assembly, always voting with the Republican party. Along with Cavaignac and Lamoricière he was arrested in December 1851, and went into exile; he died at Nantes, 30th October 1863.

Bedeguar (Persian and Arabic *bādāwar*, literally 'wind-brought,' sometimes explained as made up of Persian *bād*, 'wind,' and Arabic *ward*, 'rose'), a remarkable Gall (q.v.) of roundish shape, but covered with shaggy branched processes, like those familiar in the moss-rose, often found on the branches of various species of rose, particularly of the sweet-brier, upon which account it is sometimes called sweet-brier sponge. Although of course sharing the astringent properties of galls in general, it has long ceased to be of any medicinal repute.

Bedell, WILLIAM, Bishop, born at Black Notley, Essex, in 1571, was educated at Emmanuel College, Cambridge. From 1602 to 1613 he was incumbent of St Mary's at Bury St Edmunds, save that during 1607-11 he was chaplain to Sir Henry Wotton, the British ambassador to Venice, where he made the friendship of Father Paul Sarpi. In 1616 he retired to the neighbouring parish of Horningsheath, whence in 1627 he was called to become provost of Trinity College, Dublin. Two years afterwards he was promoted to the united bishoprics of Kilmore and Ardagh, the latter of which he resigned in 1633. He immediately set himself to reform the crying abuses that prevailed in his diocese, and with so happy a combination of wisdom, firmness, and charity, that even his enemies were constrained to do homage to his virtues. The translation of the Old Testament into Irish was accomplished under Bedell's direction (the New had been already translated). On the breaking out of the rebellion in 1641, his popularity for some time saved his family from violence, his being the only English house in County Cavan that was spared. At length he was seized and imprisoned in Loughoughter Castle. He was soon allowed to remove to the house of a Protestant clergyman at Drumlor, but there catching a fever, he died 7th February 1642. See the *Lives* by his son and by A. Clogie, edited by Shuckburgh and Mayor (1902).

Bedford, the county town of Bedfordshire, is situated on the navigable Ouse, 49 miles NNW. of London by rail, and in the midst of a broad expanse of rich pasture and corn lands. The Ouse is spanned here by two bridges—a stone one of five arches, 306 feet long, built in 1811 at a cost of £15,000, and an iron one, built in 1888 at a cost of £6000. Bedford itself is clean and well paved, and the drainage and water-supply have been greatly improved. The charitable and educational institutions are mostly due to Sir W. Harpur, Lord Mayor of London (d. 1573). He in 1566 founded a free school, and endowed it with 13 acres of land in Holborn. The enormously increased value of the property (from £150 to £15,000 a year) enables the trustees to maintain grammar, modern, and preparatory schools for boys, the same class of schools for girls, and almshouses. Under the scheme (1874) of the Endowed School Commissioners, the funds are divided thus: One-eleventh to the almshouses; two-elevenths to elementary education;

four-elevenths to the grammar-school and high-school for girls; and four-elevenths to the modern schools. The county school was opened in 1869. The chief manufacture is that of agricultural implements. Lace-making is also carried on; straw-plaiting has declined. An embankment beside the Ouse forms a pretty promenade; and a people's park was opened in 1888. Till 1885 Bedford returned two members to parliament, till 1918 one. Pop. (1851) 12,693; (1921) 40,247. Bedford is of great antiquity, and is mentioned in the *Anglo-Saxon Chronicle* under the name of Bedican-fortha, as the scene of a battle between the Britons and Saxons in 571. The Danes burnt it in 1010. Afterwards its old castle, said to have been built by Edward the Elder, is frequently mentioned in history. Bunyan (q.v.), who was born at Elstow, near Bedford, was for twelve years a prisoner in Bedford gaol, and ministered to the Nonconformist congregation in Mill Lane from 1672 to his death in 1688. His chapel has been twice rebuilt, in 1707 and 1849; but his chair and other relics of him are preserved; whilst a colossal bronze statue of him by Boehm was erected at the cost of the Duke of Bedford in 1874. New buildings for the grammar-school were opened in 1891, and the recreation-ground of 22 acres gifted by the Duke of Bedford in 1894. In 1894 a bronze statue of John Howard (q.v.) was erected.

Bedford College. See WOMEN'S RIGHTS.

Bedford, JOHN, DUKE OF, third son of Henry IV., was born about 1389. During his father's lifetime he was governor of Berwick-upon-Tweed, and warden of the Scottish marches. In 1415 his brother, Henry V., created him Duke of Bedford; and during the war with France he was left in command of the forces in England. After Henry's death (1422), Bedford went to France to look after the interests of the infant prince, his nephew. The regency of France he offered to the Duke of Burgundy, who refused it; he then assumed it himself. On the death of Charles, a few months after Henry V., Bedford had his nephew proclaimed king of France and England, as Henry VI. In the wars with the dauphin which followed, Bedford displayed great generalship, and defeated the French in several battles—most disastrously at Verneuil in 1424. But, in consequence of the rather parsimonious way in which men and money were doled out to him from England, and the withdrawal of the forces of the Duke of Burgundy, he was unable to take full advantage of his victories. The appearance of Joan of Arc, notwithstanding his utmost energy, was followed by disaster to the English arms; and in 1435 a treaty of peace was negotiated at Rouen between Charles VII. and the Duke of Burgundy, which effectually ruined English interests in France. The death of Bedford, which took place September 19, 1435, fourteen days before the ratification of that treaty, was mainly, if not altogether, occasioned by his anxiety and vexation on account of the union thus formed. Bedford, who was a patron of letters, purchased and removed to London the Royal Library of Paris, consisting of 900 volumes. For the present dukedom of Bedford, see RUSSELL.

Bedford Level, an extensive tract of flat land in the east of England, embracing nearly all the marshy district called the Fens. It extends inland around the Wash into the six counties of Northampton, Huntingdon, Cambridge, Lincoln, Norfolk, and Suffolk, and has an area of about 750,000 acres. Its inland boundary forms a horseshoe of high lands, and reaches the towns or villages of Brandon, Milton (near Cambridge), Earith, Peterborough, and Bolingbroke. It is divided into three parts—the north level, between

the rivers Welland and Nene; the middle, between the Nene and the Old Bedford River; and the south, extending to Stoke, Feltwell, and Mildenhall. It is intersected by many artificial channels, as well as by the lower parts of the rivers Nene, Cam, Ouse (Great and Little), Welland, Glen, Lark, and Stoke. It receives the waters of the whole or parts of nine counties. This district seems to have been a great forest at the time of the Romans, who cut the forest down, formed great embankments to exclude the tide, and rendered the tract for a time a fertile inhabited region. In the 13th and other centuries violent incursions of the sea stopped the outflow of the rivers, and it became a morass. The practicability of draining this extensive region seems to have been thought of in 1436, and many partial attempts were made after this. The first effectual effort was in 1634, when Francis, Earl of Bedford, after whom the district was thenceforth called, obtained, along with thirteen others, a grant of 95,000 acres of the reclaimed land on condition of draining the level. The work was partially accomplished in three years, at a cost of £100,000; but was pronounced inadequate by government. Charles I. tried to get the work, with a greatly increased premium, into his own hands; but the civil war stopped further progress. In 1649 parliament confirmed William, Earl of Bedford, in the rights granted to his father; and after a fresh outlay of £300,000, the contract was fulfilled. In 1688 a corporation was formed for the management of the level. The middle level has always been the most difficult to manage; and the work on it, with one drain 11 miles long, was only completed in 1852 at a cost of £400,000. The St Germans sluice, at the confluence of that drain with the Ouse, was considered perfectly secure. But in May 1862 it gave way under the pressure of a strong tide, and the western bank of the middle-level drain burst, speedily flooding about 6000 acres of fertile land. This led to the construction of a permanent cofferdam of pile-work to shut off the tidal waters; and for the drainage of the middle level, Slater's Lode sluice was taken advantage of; siphon pipes being laid over the cofferdam, the flood-waters let off by them and by drains, the siphons acting as permanent sluice.

See books by Heathcote (1876), Miller and Skerthly (1879), Miller (1890), the Duke of Bedford (1897), and *Fenland Notes and Queries* (1891-1909).

Bedfordshire, a midland county of England, surrounded by Hunts, Cambridgeshire, Herts, Bucks, and Northants. It is one of the smallest of English counties. Extreme length, 31 miles; breadth, 25; area, 461 sq. m. The general surface is level, with gentle undulations. In the south, a range of chalk-hills, branching from the Chilterns, crosses Bedfordshire in a north-east direction from Dunstable, and another parallel range runs from Ampthill to near the junction of the Ivel with the Ouse. Between the latter ridge and the north-west part of the county, where the land is also somewhat hilly, lies the corn vale of Bedford. No hill in Bedfordshire much exceeds 500 feet in height. The chief rivers are the Ouse (running through the centre of the county, 17 miles in a direct line, but 45 by its windings), navigable to Bedford; and its tributary, the Ivel, navigable to Shefford. By these rivers Bedfordshire communicates with the counties of Cambridge, Huntingdon, and Norfolk. The south and south-east parts of the county consist of chalk, and the north and north-west of oolitic strata. Freestone is quarried, as well as chalk or clunch, to be burnt for lime. The soil varies greatly. In the south of the county it is chalk thinly covered with earth, and fit only for sheep-walks; but three-fourths of the county is

clay, which is very stiff between the Ivel and Ouse. A rich gravelly loam exists along the rivers. In the vale of Bedford the soil is chiefly rich clay and deep loam; and to the north the clay is stiff, poor, and wet. There are extensive market-gardens, especially on the rich deep loams. Bedfordshire is the most exclusively agricultural county in England, its cultivated area being 88.1 per cent., against 79.3 for the whole kingdom. Pop. (1801) 63,393; (1881) 149,473; (1921) 206,478. The principal proprietor is the Duke of Bedford; and his seat, Woburn Abbey, is the chief mansion. Lace-making and straw-plaiting—for which Dunstable is celebrated—are leading industries, and they are carried on almost entirely by women. Three members of parliament are returned for the county of Bedfordshire, one each for the Bedford, Luton, and Mid divisions. Many British and Roman antiquities exist in the county, as well as the ruins of several monasteries, and some fine relics of Romanesque and Gothic architecture among the parish churches. Three Roman roads crossed the county. See the 'Victoria History' (1904-12), and C. Gore Chambers, *Bedfordshire* (1917).

Bedlam (now officially written *Bethlem*), the London lunatic asylum, originally founded in 1247 as a priory at Bishopsgate, its mother-church being St Mary's of Bethlehem (or Bedleem in Wyclif's spelling). It is spoken of as a hospital for lunatics in 1472, and as such it was granted at the dissolution to the mayor and citizens of London, being incorporated as a royal foundation in 1547. In 1676 it was transferred to Moorfields, and in 1815 to St George's Fields, Lambeth. This the present hospital was extended in 1838; but when Broadmoor was built in 1863, the criminal wings were pulled down. In the old Moorfields days the management of Bedlam was deplorable. The patients were exhibited to the public, like wild beasts, as we see in Hogarth's picture, and read in Pepys and Boswell; *Northward Ho* bears witness to the same custom in the Bishopsgate period. Before 1675 convalescents, with badges on their arms, were turned out to beg in the streets; Edgar, in *King Lear*, personates one of these 'Tom-o'-Bedlams.' Even in 1815 there was no glazing, warming, or lighting of the cells, and some inmates were kept in chains.

Bedlington Terrier, a breed originated about the beginning of the 19th century by Mr Aynsley of Bedlington, near Morpeth, in Northumberland, to which county it was almost entirely confined for many years. Its chief points are the following: Muzzle, long and fine, but very powerful; head, high in the skull and rather narrow, the hair on the top being softer and of a lighter colour than on the rest of the body; eyes, small, dark, and slightly sunk; ears, rather large and filbert-shaped, hanging close to the cheeks, and slightly feathered; neck, long, slender, but muscular; body, well proportioned, and deep chested, though rather lightly ribbed; legs, straight and somewhat long; tail, of moderate length, tapering to a point, with no feather; coat, fine but not soft, short and rather thin; colour, liver or sandy, with flesh-coloured nose, or blue-black, with black nose, the latter being the commoner colour; weight, from 16 to 20 lb.; height, 13 inches. The Bedlington terrier is remarkably high couraged, and makes a splendid vermin dog, on account of its activity and pluck, and will face even an otter or badger without finching. It also makes a capital water-dog, and may be broken to the gun, for which purpose its speed and cleverness make it highly useful.

Bedmar, ALFONSO DE CUEVA, MARQUIS DE, born in 1572, won an enduring notoriety on account

of his daring and unscrupulous plot for the destruction of Venice, to which city he had been appointed ambassador from the court of Spain in 1607. He first leagued himself secretly with the Duke of Ossuna, viceroy of Naples, and Don Pedro of Toledo, governor of Milan, then purchased the services of a large number of foreign mercenaries, while Ossuna furnished him with a band of privateers, or rather pirates. The day chosen for carrying out his purpose was that on which the doge wedded the Adriatic, when all Venice was intent on beholding the august ceremony. Fortunately, the night before, one of the conspirators betrayed the plot. Several persons were executed; but curiously enough, Bedmar, the arch-delinquent, was only dismissed. The event forms the subject of Otway's *Venice Preserved*. Bedmar now went to Flanders, where he became president of the council, and in 1622 was made a cardinal by the pope. He then went to Rome, and finally returned to Spain as Bishop of Oviedo, where he died in 1655.

Bednor', BEDNUR, or NAGAR, a decayed city, now a village, of Mysore, India, situated in the midst of a basin in a rugged tableland of the Western Ghats, at an elevation of more than 4000 feet above the sea, 150 miles NW. of Seringapatam. It was once capital of a rajah, with a population of 100,000, and in 1763 it was taken by Hyder Ali, who pillaged it of property worth £12,000,000.

Bed of Justice (Fr. *lit de justice*; Lat. *lectus justitie*, *lectus* being a couch as much as a bed), literally, the seat or throne occupied by the French monarch when he was present at the deliberations of parliament. Historically, a bed of justice signified a solemn session, in which the king was present to overrule the decisions of parliament, and to enforce the acceptance of edicts or ordinances which it had previously rejected. The theory of the old French constitution was that the authority of parliament was derived solely from the crown; consequently, when the king, the source of authority, was present, that which was delegated ceased. Acknowledging such a principle, the parliament was logically incapable of resisting any demand that the king in a bed of justice might make, and decrees promulgated during a sitting of this kind were held to be of more authority than ordinary decisions of parliament. Monarchs were not slow to take advantage of this power to overawe any parliament that exhibited signs of independence. The last bed of justice was held by Louis XVI. at Versailles in September 1787, when the whole parliament were arrested and confined in prisons in different parts of France.

Bedos de Celles, DOM FRANÇOIS, a Benedictine monk of the congregation of St Maur, and the most learned and practical master of the art of organ-building in the 18th century. He was born at Caux in 1706, and entered his order in 1726 at Toulouse. He was elected a member of the Academy of Sciences in 1758; in 1766-78 was published for the academy his great work, *L'Art du Facteur d'Orgues*, in 4 vols. large folio, with 137 copperplates, beautifully executed. He died in 1779.

Bed'ouins (Arab. *Bedawi*, 'dwellers in the desert') are Arabs who lead a nomadic life. The most ancient notices found in Scripture agree, in their descriptions of the manners and customs of the Bedouins, with the facts of the present time. As nomads, the Bedouin Arabs have no united history, but only a collection of genealogies. They have but seldom appeared as a united people taking a prominent part in the world's politics, and have never been entirely held in subjection by any

foreign power. The desert of Arabia is their central place of abode; but even in ancient times they had spread themselves over the deserts of Egypt and Syria; and in later times they entered Mesopotamia and Chaldea. The conquest of Northern Africa in the 7th century opened up to them still vaster tracts. At present they are to be found from the western boundary of Persia to the Atlantic, and from the mountains of Kurdistan to the negro countries of Sudan. In the cultivated lands of Mesopotamia, Chaldea, the Syrian confines, Barbary, Nubia, and the north of Sudan the Arabs are found intermingled with other nations; but in the deserts they have maintained their distinct character and independence. They form a seventh part of the population of Arabia. The characteristics of the Bedouins, as herdsmen and robbers in the desert, are intimately connected with the nature of their habitation. Their abstinent, precarious, and often solitary mode of life makes them disposed to exercise mutual hospitality; but their independence, love of liberty, and other good qualities, are associated with violent passions and an infamous love of plunder, reckless of the rights of property. They are lean, sinewy, and active, but commonly below middle stature. Their senses, especially sight, are keen; the nose is commonly aquiline; in complexion they are of various shades of brown. With the exception of certain tribes in Syria, all the Bedouins are professedly Mohammedans, but are as much Sabæans, and have, beyond a belief in one God, extremely little religion. Clergy are unknown, except where dread of the Wahabis extends. Though the Bedouins' intellectual powers are naturally good, they are miserably destitute of solid knowledge. Their endless tales and poetical effusions show a wonderful activity of imagination and an oriental love of hyperbole. The relation of the sexes to each other is less constrained than among the settled peoples of the East. Bigamy is rare, polygamy scarcely known; divorce of the wife is extremely common and easy. Their diet is principally derived from their herds, but includes rice, a few vegetables, honey, locusts, and even lizards. They manufacture their own woollen clothing. Many tribes shave the head; but among all the beard is a favourite object of cultivation. The political condition of the Bedouin is patriarchal. One or more families form the core of a tribe, and constitute a kind of aristocracy. Out of their number the superior *sheikh* is elected, who leads those of the tribe that choose to follow, and the *kadi*, who judges between such litigants as accept his award. But custom is law, and each tribesman is his own executive. This sketch of the Bedouin applies chiefly to the true nomads, or 'dwellers in the desert,' and is subject to modifications with regard to tribes in Barbary, Syria, and Mesopotamia, who practise agriculture, and dwell in houses.

Bed-sores are often a very troublesome complication of illness, to which a patient is liable when, confined for a long time to bed, he is either unable or not allowed to change his position. Their occurrence often prevents successful results in the most careful medical treatment, or the most brilliant surgical operations which would otherwise be quite successful, as their presence depletes vitality, offers an opening for the entrance of disease germs, and prevents cure, more than any other adverse circumstances can do in cases of prolonged treatment in bed. They attack the skin over bony prominences, especially the lower parts of the spine, the haunch-bones, the heel, and the elbow. The skin becomes red at first, and its surface is gradually abraded; this may end in the death of a portion of the skin, which separates

as a *slough*, and a deep ulcer appears beneath it. General debility, the continued fevers (especially typhoid), paralysis, and old age are strong predisposing causes. The immediate causes are continuous pressure on the affected parts and a lack of care in nursing, as, for instance, incomplete cleanliness, where the evacuations escape involuntarily, and where the undersheet is not kept smooth and free from irritating particles. Hence in all cases of prolonged confinement to bed the parts naturally pressed upon by the weight of the body should be carefully examined every day. When a long confinement to bed is expected, attempts should be made to thicken the cuticle, and enable it to bear pressure better, by rubbing the skin with a stimulant such as spirits or eau-de-Cologne. If the part, when first seen, looks red and rough, further damage is often prevented by covering it with a piece of lint on which vaseline has been spread; the local pressure may be removed by air-cushions specially constructed for cases of this kind, and in many instances a water-bed affords great comfort. If the case is one in which it is admissible, the patient should be made to alter his position frequently. Should an abrasion form, it must be treated by the application of dressings of damp boric lint. At this stage, also, all pressure must be removed from the part if possible. When the dusky colour of an insulated piece of skin shows that a *slough* is forming, a water-dressing must be applied, and renewed every eight hours. It consists of four layers of boric lint cut a little larger than the size of the livid portion of skin. The lint, wrung out of hot water, is covered by a piece of oiled silk that overlaps it for half an inch in every direction. When the slough separates, a similar dressing should be continued for the ulcer, on the surface of which a little iodoform is sprinkled before the water-dressing is applied. In severe cases a 'prone couch' should be used, on which the patient lies on his face. This gives great relief, and allows healing to take place.

Bedstraw (*Galium*), a genus of Rubiaceæ (q.v.). The species are very numerous, natives chiefly of the colder parts of the northern hemisphere, or of mountainous regions within or near



A, Common Great Bedstraw (*Galium elatum*);
B, Yellow Bedstraw (*Galium verum*).
a, flower; b, fruit.

the tropics. About eleven species are found in Britain, some of them very common weeds. Amongst these is Our Lady's Bedstraw, or Yellow Bedstraw (*G. verum*)—sometimes called Cheese

Rennet, because it has the property of curdling milk, and has been long used for that purpose (whence the generic name from Gr. *gála*, 'milk')—a small plant with linear deflexed leaves and dense panicles of bright yellow flowers, very abundant on dry banks. The flowering tops, boiled in alum, furnish the Icelanders with a bright yellow dye; while the Highlanders used to employ the root-stock for dyeing yarn red. Their colour being essentially that of the allied madder, the cultivation of the plant was attempted many years ago. Certain North American species, especially *G. tinctorium* and *G. septentrionale*, have been used in the same way. Like madder, they possess the property of imparting a red colour to the bones and milk of animals which feed upon them. Medicinal virtues were ascribed to some of the species, as *G. rigidum* and *G. mollugo*. The roasted seeds of some, as *G. aparine*, the troublesome Goosegrass, or Cleavers (q.v.), have been recommended as a substitute for coffee. Its expressed juice is in some countries a popular remedy for cutaneous disorders, and is used as a diuretic. The roots of *G. tuberosum* are farinaceous, and it is cultivated in China for food. The name *bedstraw* is due to the old legendary name of one of the species, 'Our Lady's Bedstraw,' analogous to 'Our Lady's Garters, Mantle, Slippers,' &c.

Bedworth, a market-town of Warwickshire, 3 miles S. of Nuneaton.

Bee. Bees form a group of insects in the order Hymenoptera, in the same sub-order (Aculeata) as the wasps and ants. Like other Hymenoptera, they have four membranous wings, with few nervures, and the hind-wing has a row of hooks which fix on to the fore-wing, so that the two move as one in flight; the mouth parts are suited for biting and for sucking or licking; the first ring of the thorax (the prothorax) is fused with the next segment, the mesothorax; the metamorphosis is complete. As in most other Aculeata, the females, including the workers, have a protrusible sting (a modified ovipositor) at the end of the abdomen; a narrow waist or stalk is formed between the first and second segments of the abdomen; the male has thirteen joints in its antennæ, and the female twelve; the larvæ are footless grubs which are reared in special 'cells.' In bees in particular (Apiariæ) the body is thick and short, and usually hairy; the hind-legs, especially the posterior pair, are usually broadened, and have a brush of hairs suited for the collection of pollen; and the first and second maxillæ are elongated so that they more readily reach the nectar in the deep cups of many flowers.

History.—Bees must have been among the first insects to engage human attention. Their comparatively large size, abundant occurrence, social life, and honey-storing habits appear to have been from very early times facts of common observation. Aristotle has gathered up some of the opinions of his contemporaries in regard to bees—opinions, however, in which much fancy is mingled with some acute observations. Virgil has described the habits of bees in his fourth Georgic with all the license of a poet and the enthusiasm of a lover of nature. Pliny repeats, as he was wont, all the floating bee-gossip of his time, but without criticism or analysis. For about fourteen centuries after Pliny, bees were unmolested by the naturalist, and were, as far as we know, only thought of as the sources of occasional luxury. With the Renaissance, however, the natural history of bees became again the subject of study. Works by Edward Wotton and Conrad Gesner contain numerous trustworthy observations, and were the preface to a series of careful studies by

various naturalists in the latter half of the 17th century. Conspicuous among these are the works of Swammerdam (*General History of Insects*, 1669); the memoirs of Maraldi (1712), who is said to have been the first to use glass-hives; and the clear observations of John Ray and his friend Willughby. On a higher plane of detailed anatomical research stands the immortal work of Réaumur (*Mémoires pour servir à l'Histoire des Insectes*, 1732-44), from which the systematic and thoroughly scientific study of bees may be said to date. His contemporary Bonnet also was the author of numerous important observations; while among the crowd of naturalists who have worthily continued the researches of Réaumur, the patient and ingenious Huber is undoubtedly pre-eminent (*Nouvelles Observations sur les Abeilles*, 1814). The more modern experimental method of investigation is well represented by Sir J. Lubbock's (*Lord Avebury's*) researches (see *Ants, Bees, and Wasps*).

Form and Structure.—Before noting the more important features in the anatomy of the bee, it is necessary to recall the familiar fact that many kinds of bees are social, that is to say that they live in communities. The following observations apply to the hive-bee. As in the case of ants, various sets of members have come to discharge special functions, and the result of this division of labour has been difference of form, or polymorphism. In fact, the result of restricted function has been the establishment of castes. Thus the ordinary hive contains (1) a single queen-bee—the fertile female and mother of the next brood, (2) the males or drones, and (3) the vast majority of workers or imperfectly developed females, which only exceptionally become fertile. In describing the anatomy, the ordinary hive-bee (*Apis mellifica*, L.) will be principally referred to. Like that of other insects, the body of the bee is readily divisible into three portions—head, thorax, and abdomen. The head is well defined from the body, and bears the organs of sight, touch, mastication, and honey-collecting. There are two compound eyes, borne on the sides of the head. They are largest in the males, and meet on the crown. Besides these there are, on the top of the head, three eye-spots or ocelli, concerning the exact function of which there is some difference of opinion. Below the eyes are (1) two jointed feelers or antennæ, most essential organs of sensation. The basal joint is much the largest, and the stalk formed from the eleven or twelve smaller ones extends outwards at a sort of knee-like angle (geniculate). In the antennæ of the males there are thirteen joints; in those of the females, twelve. (2) Next come the horny, toothed mandibles, freely articulated to the head, and well adapted for cutting the resinous cement or propolis into shapes, for the finer work of handling the pollen, for biting through the corollas and other obstructions of flowers, and the like. The other two pairs of head appendages are greatly modified for collecting the nectar from the flowers. (3) The first pair of maxillæ are much elongated flattened blades, embracing the second pair, and forming the outer sheath of the proboscis, as the entire collecting organ is called. They form the outer wall of a sort of suction-tube. The tips of these blades, however, remain sharp, and act as efficient piercing organs. The external portions of this first pair of maxillæ, the so-called maxillary palps, degenerate, and only remain as much-reduced structures with a few joints. (4) The fused basal portion of the second pair of maxillæ, the *mentum*, as it is called, is in movable membranous and elastic connection with the cardines or bases of the first pair.

This *mentum* bears internally the long structure known as the *ligula* or *tongue*. This is a much

elongated slender hairy organ of varying firmness throughout its course. It occupies a number of very different positions according to the business of the bee at the moment, but a description of these would involve inconvenient detail. The four main positions are very lucidly depicted in Hermann Müller's *Fertilisation of Flowers*. When at rest, the internal portion of the tongue is somewhat



Fig. 1.—Mouth Organs of Honey-bee (*Apis mellifica*):
a, tongue; b, b, labial palps; c, c, first maxillæ.

curled up and retracted into the lower end of the mentum. It is capable of very rapid protrusion and of free motion in almost every direction. The external lateral portions or labial palps are comparatively small, and consist of two long and two short joints. Their tips remain as tactile organs, while their internal joints are elongated to form a sheath for the base of the tongue. Between the palps and the tongue there are also two very small structures known as *paraglossæ*. The whole proboscis thus consists of hairy tongue, of minute paraglossæ, of insheathing labial palps (all belonging to the second pair of maxillæ), and further, of external maxillary blades and reduced palps belonging to the first pair. The hairs which cover the tongue appear to serve for the upward passage of honey. The successive whorls have been seen to be erected from before backwards so as gradually, but rapidly, to sweep the nectar to the mouth. The expanded lobe at the tip of the tongue is thrust into the nectar, and a little appears to pass up a central capillary tube to the taste organs, by which the bee determines whether the food does or does not suit its taste. The tip may also be used to lick flat surfaces. The upward passage of the nectar among the hairs on the outside of the tongue and within the outer sheath is doubtless helped by the sucking action of the sides of the body, and of the first part of the food-canal. According to a recent investigator (Breithaupt), the honey may pass up either by the great suctorial tube of the proboscis, or when that ceases to be efficient, by the capillary tube of the tongue, but the exact action of this complex and beautiful organ is not yet thoroughly understood. The tongue of the workers is twice as long as that of the queens or the drones, who do not collect honey.

The somewhat oval *thorax* bears the two pairs of wings and three pairs of legs, and consists of the usual three segments, of which the most anterior (the prothorax) is greatly reduced. The wings,

which are borne on the last two segments, are membranous and transparent. When at rest, they are folded together over the back; when in action, the two pairs are clasped together by means of small hooks on the fore margin of the hind pair. Perhaps it was this close union of the wings which suggested to Linnaeus the name Hymenoptera or 'wedded-wings,' though the term may simply refer to the fact that the wings are membranous. The arrangement secures a very steady and rapid flight. The many-jointed mobile legs do not differ from those of other insects, except in the high development of pollen-collecting hairs. In the workers the hind pair of legs exhibit on their central joint a spoon-shaped cavity fringed with bristles, so as to form an efficient pollen-basket. The pollen is kneaded by mouth and fore-feet, and shifted by the middle pair of legs to the safe hollow behind. The two terminal claws of the feet are used when the bees climb and hang, while the membranous lobe between the hooks probably aids in handling minute bodies and in clambering on smooth slippery surfaces.

The *abdomen*, or posterior portion of the body, is joined to the thorax by a comparatively narrow bridge. The margins of successive segments overlap, and the whole region is capable of free respiratory movements. Like other parts of the body, the abdomen has a dark-brown colour, with somewhat lighter cross bands. The females bear at the end of the body an ovipositor or sting, which consists of a median piece deeply grooved on its lower surface and of two adjacent sharply pointed structures, which being apposed to the median piece, make the groove into a canal. The internal end of the canal thus formed is in connection with the female generative aperture, so that the eggs can pass neatly down from the body of the bee into the cell prepared as a cradle.

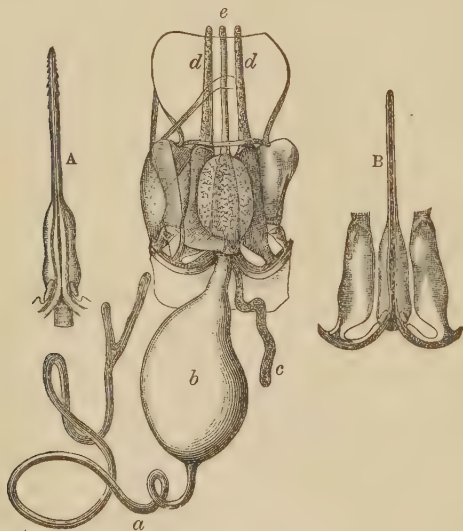


Fig. 2.—Sting of Worker-bee (*Apis mellifica*).
(After Kraepelin):

a, poison gland; b, poison bag; c, accessory gland; d, outer supporting pieces; e, inner sheath inclosing sting proper.
A, sting proper; B, sheath in which sting works, seen from below.

But the base is also connected with a poison-bag containing formic acid and other irritants, which are squeezed into the wound made by the sharp sting, and are the obvious causes of the familiar inflammation. In the queen-bees this specialisation of abdominal appendages forms a long, stout,

curved organ, which is occasionally used as a weapon in duels with rivals, but much more frequently for its main business as an egg-laying organ; in the workers it is rarely used except as a sting; in the drones it is represented by the external male genital organs.

The Internal Organs—The Food-canal.—The nectar drawn up by the proboscis passes through a short pharynx into a narrow gullet. In the abdominal region this expands into a crop or honey-sac, a transparent bag, filled with honey in the bees returning heavy laden to the hive. This crop opens by a complicated funnel and stopper into the digestive stomach, which is followed by the coiled intestine. Opening into the anterior region of the food-canal there are three or four pairs of salivary and other glands. In the worker the nectar may reach the stomach and be digested, or it may be delayed in the crop and regurgitated into the cells of the comb.

The Nervous System.—As in other insects, the nervous system consists of a ganglionic mass above the gullet (the brain) and of a ventral chain of ganglia, of which the anterior are connected with the dorsal mass by means of a nerve-ring round the gullet. The two posterior ganglia in the thorax are fused into one, and beyond this are five or six abdominal ganglia. The presence of these separate nerve-centres or ganglia in the body explains the apparent vitality of bees and other insects for some little while after the removal of the head.

The circulatory, respiratory, excretory, and reproductive systems do not differ markedly from those of other insects. The usual dorsal chambered heart is present. The main stems of the tracheae or air-tubes, by means of which the air passes throughout the whole body, are very large and dilatable, especially in the abdominal region. The buzzing of bees is partly due to the rapid movement of the wings, and partly to the vibration of the stigmatic membranes which guard the entrance to the air-tubes. The excretory system is represented by long thread-like 'Malpighian tubes' which open into the intestine. The queen is the only fertile female with fully developed reproductive organs, but the workers have vestigial ovaries and may occasionally lay eggs. It may be by accidental or by deliberate change in the nutrition that a worker becomes occasionally reproductive. The female reproductive organs of a queen-bee consist principally of ovaries, oviducts, ovipositor, and a storing-chamber for the male elements, known as the sperm-reservoir or spermatheca. The eggs are fertilised just before they are laid by spermatozoa from the spermatheca. But some are not fertilised, and these develop into drones. Thus drones have a mother, but no father. It has been reported that spermatozoa may remain alive for two or even three years in the spermatheca of the queen-bee. All the ova of the bee seem to be of the same kind, and all undergo what is called reducing division or meiotic division (see CELL) in the process of maturation or polar-body-forming. The number of nuclear bodies or chromosomes is reduced to one-half the normal number, say from n to $\frac{n}{2}$. All the spermatozoa are said to have $\frac{n}{2}$

chromosomes. The fertilised ova have $\frac{n}{2} + \frac{n}{2} = n$ chromosomes, and develop into queens and workers—functional and arrested females. The unfertilised ova have $\frac{n}{2}$ chromosomes, and develop into males.

Functions and Habits.—It has been already noted that the social life of bees has resulted in some division of labour. At the beginning of spring the hive contains a single queen and

a much-reduced contingent of workers. Their first care is to restore the normal population. Towards this end the queen lays numerous eggs which develop into *workers*. After the stock has been thus replenished, eggs are laid which turn out males or *drones*. After they begin to appear, eggs are laid which develop into more *workers*, and also into a few *queens*. The rapid increase of population culminates in the emigration known as *swarming*, when the old queen leads off a large contingent of subjects. The date of swarming is markedly affected by the temperature and the food-supply. The symptoms of emigration are such as these—a clustering of bees in small dense crowds outside the hive, a commotion among the drones, a suspension of the labours of the workers, the excitement of the queen-mother, and, in the case of second or third swarms, the piping of the still imprisoned young queens. She is exasperated by the presence of possible rivals in her own household, and would ruthlessly kill her royal children, were they not guarded by the workers. In the case of swarms centred around an old queen, it seems customary to send out scouts to explore the land before the bees take any decisive steps towards emigration. When at length the pressure and excitement has reached a climax, the emigrants rush out with great rapidity. They form a spreading crowd, concentrating, however, round the egg-laden queen, who is rarely able to fly far. During swarming, the bees are singularly quiet, and may be safely handled. Should the queen be lost or removed, the bees soon return much depressed to their old home. The workers seem to take with them a heavy load of honey, and they at once set about building a comb, in the first cells of which the queen, losing no time, lays some eggs. The disruption of swarming obviously robs the old hive of its queen, but there are princesses ready to be liberated, and these may soon lead off fresh swarms.

A populous stock will often send off three in rapid succession. When the season and necessity for swarming is past, the young queens that remain imprisoned in the royal cells are liberated at once and allowed to fight for the sovereignty. The survivor takes her nuptial flight. By one, or perhaps several, of the males she is impregnated, though some authorities believe that the fertilisation is effected by drones from another hive. After impregnation has been accomplished, the young queen settles down to begin her egg-laying; she continues this throughout the rest of the summer. When swarming time is over, and the supply of honey decreases, the bees commence to rid the hives of the drones, henceforth mere useless consumers. They appear to drive them into a corner, and

suggests the difficult problem of the meaning of so many males. Their number, of course, insures the fertilisation of the queen. Romanes suggests that the numerous drones represent a survival of past times when the society was less complex, and when the females were probably more numerous, and the males less idle. If there is any chance of drones being needed, when for instance the queen is barren, and fresh ones have to be reared and fertilised, they are allowed to live beyond their usual term. On the other hand, when unfavourable weather prevents swarming, the workers in their despair sometimes massacre the drones.

The queen-bees are reared from special eggs, which begin to be laid after the drones appear on the scene. According to some, the queen herself deposits in the special royal cells the eggs which develop into future queens; according to others, the workers shift the eggs into these specially large cradles. They develop very rapidly in consequence of rich nutrition, attaining their maturity in about sixteen days. The queen is always treated with much respect and care, unless she turn old or become barren. An intruding stranger-queen is not always treated with respect, but may be pulled about by the workers for hours until she dies, and is thrown out of the hive. A queenless hive, without any prospect of a new sovereign, becomes completely demoralised and restless, but in this case a stranger is gladly adopted.

Just as the drones and queens maintain the numbers of the hive so far as reproduction is concerned, so the supplies of food are collected by the myriads of workers. Among these there is some slight division of labour. Members of the community varying in age and constitution, are told off to special tasks. Thus we can distinguish the external workers who collect nectar and pollen from those who attend to more internal domestic duties. Some of the internal workers, usually the young bees, act as nurses, effecting the mastication and semi-digestion of the food for the young larvæ, and caring for all the needs of the brood; while some wait upon the queen. Others again devote their energies, for a time at least, to the architecture of the cells, for which some of the heavy eaters secrete the wax. Others attend to the ventilation of the hive, which is apt to become hot enough not only to be disagreeable, but to soften the wax. These ventilators fan industriously with their wings, and produce air-currents through the hive strong enough to blow out a lighted match. 'When they are tired they are relieved by others.'

Feeding.—Bees feed principally on the nectar and pollen of flowers. In spring they frequent the early-flowering willow, hazel, plane, apple, pear, alder, gooseberry, currant, &c. Later on they turn to the crowfoot, clover, vetch, turnip, cabbage, dandelion, buckwheat, balsam, privet, elder, bramble, and other flowers, which yield abundant nectar and are accessible to their probosces. The borage, the mignonette, the thyme, the heathers, the teasel, are also valuable sources of food. Plants like the furze, which keep flowering for a long time, are obviously of great value to bees and bee-keepers. Some flowers abounding in nectar are avoided because of their strong smell, others like the red clover and the honeysuckle are inaccessible to bees with a proboscis not larger than that of the common hive-bee. Attempts have been made in Britain to rear varieties which would be able to utilise the abundant red clover, inaccessible to the common bee.

When the bee proceeds to rob a flower of its nectar, the tongue, folded up when at rest, is protruded beyond its ensheathing parts, and is pushed as a probe into the flower-tube. By the action of the hairs on the outside of the tongue, or by the



Fig. 3.—Honey-bee (*Apis mellifica*): keep them without food until their powers of resistance are much weakened. They are then turned out of doors to perish, for the workers seem rarely to use their stings. Even the infant pupæ and the eggs are destroyed. The fact of this massacre

general action of the suctorial proboscis, helped by muscular contractions of the body, or by an ascent up the fine capillary tube of the tongue, the nectar is conveyed to the mouth. Thence it passes down the gullet into the honey-bag, and is partly used for the sustenance of the worker itself, being digested in the stomach, and passing thence to the body generally. A large surplus, however, remains as a contribution to the honey-store of the hive, which is stored up for consumption during the flowerless season. Where there is no real winter, as in warmer countries (Australia and California), imported European bees tend to lose their storing instinct, and to become idle.

Besides the nectar, the *pollen* of flowers is essential to the normal life of bees; it is the ambrosia of the hive, and is largely used as food for the young. As the nectar is non-nitrogenous, the necessity for some other kind of food is obvious. Drones and queens, however, never eat raw pollen, and must therefore get their nitrogen indirectly. The special food supplied to the young is formed from pollen partly digested along with honey. The pollen is collected by the hairs of the body, from which it is cleaned off by the feet and jaws, damped with dew or other moisture, mixed with a little honey ejected from the mouth, kneaded into pellets, taken up by the brushes on

the hind-legs, and deposited in the baskets in which it is carried home. The cargo thus brought to the hive may be immediately seized by the nursing bees, or may be stored up for future use. In the first case it is worked up by the nurses into a suitable state and given to the larvæ. In the other case the worker frees itself from its burden, pulling it off with its fore-

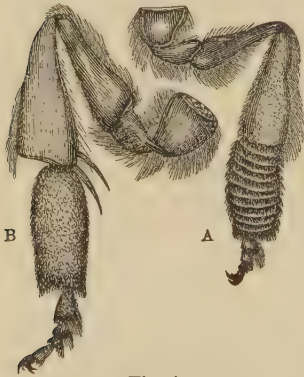


Fig. 4.

Hind-leg of Honey-bee, A; Humble-bee (*Bombus lapidarius*), B.

legs over a cell in the comb, and starts off again for more, while another bee packs the pollen into the cell, with the addition of a little honey, and covers it over with a varnish. The industrious collectors restrict themselves on each journey to a particular kind of pollen. Bees may also consume the juices of plants, and do not hesitate to suck the bodies of the deceased or murdered grubs. In periods of scarcity, large quantities of the juices ('honey-dew') of aphides, and other small insects, may be stored.

It is difficult to understand on the principles of a selfish philosophy the extraordinary industry of the workers in their food-collecting. It cannot be called greed, since it is more for the good of the society than for their own. It is also well known that the rage for plunder often prompts bees to engage in warfare. Many individual bees try robbery on their own account, attempting to sneak into neighbour hives. In other cases four or five act in concert as highway robbers, waylaying some honey-laden victim, and outrageously despoiling it. It is even said that simple intimidation sometimes results in a submissive handing over of spoil. But in other cases a whole army of bees attacks a hive probably supposed to be at once rich and weak.

Their first care is to demoralise their enemies by killing the queen. This done, the rest is generally easy, and the panic-struck owners may even help the invaders to carry home their own honey.

Bees also collect a resinous, strongly adhesive, reddish-brown substance, known as *propolis*. This is obtained chiefly from the resinous exudations of such trees as fir, poplar, alder, birch, willow, horse-chestnut, &c., and is much used by the bees as a cement. With it they varnish the combs, stop up holes, and 'strengthen the outworks of their city.' It may also be used for stranger and more occasional purposes, such as sealing up an intruding snail. The bees carry it home on their legs; other workers clean it off, and utilise it while still ductile, mixing it with various proportions of wax according to the use to which it is put. Bees also appreciate the honey-dew which appears on the leaves of many trees and herbs, usually in association with aphides.

Secretion.—The wax used in the construction of the comb is manufactured by the bees themselves. It has been shown that they are able to form it even when fed exclusively on honey. After a heavy meal, they often hang together in a small festoon, and secrete large quantities in this state of repose. The secretion is exuded from eight wax-pockets situated on the ventral surface of the abdomen. The wax projects in small flakes between the rings, is removed by the legs, shifted forward to the mouth, masticated by the jaws, and laid in heaps for the use of the comb-builders. In a young hive these wax scales may be found in thousands upon the floor.

Another secretion of a very different nature is the poison. This consists of a transparent fluid with much formic acid and other irritant components, and is secreted by workers and queens in a venom-bag situated near the end of the alimentary canal. There the waste products of honey literally form poison, which flows down between the two barbed piercing organs forming the main part of the sting. The scabbard or sheath of the sting has been already referred to as the ovipositor. The barbed form of the sting makes it very difficult for the bee to withdraw it after striking its foe, and thus death is generally the nemesis of passion, though, as we have seen, this is avoided in the massacre of the drones. The queens have longer and stouter stings than the workers, but are very slow to use them. They rarely have occasion to do so in fact, except in their duels with other rival queens. The best precaution against being stung is quietness. Of the numerous curative applications, ammonia solution (hartshorn) is one of the most serviceable. See POISONS.

In regard to secretion, it is only necessary to notice further that the bee-larvæ, like so many other young insects, secrete a certain amount of silk to form chrysalis-robes.

Hive-life.—During winter and early spring the bees remain at home, but the temperature of the hive (usually 45° F. at least) shows that they are not asleep. In March or April the work of the year begins—the hive is cleaned, the dead bodies are removed, and the queen begins to lay. We have noticed how the first eggs produce workers developing in twenty-two days; how a second set become drones developing in twenty-five days; and how in midsummer some eggs develop (in sixteen days) into young queens; how the birth of workers increases the population, much reduced during the winter; and how in a short time a swarming occurs.

Cell-building.—The bee 'combs' consist of a series of waxen cells constructed by the workers for storing honey and as cradles for the young. They hang perpendicularly within the hive, firmly fixed to the walls. Each consists of a double

row of cells disposed at right angles to the comb. Each cell of this two-sided comb is a hexagonal prism, with its internal apex lying in the depression between three adjacent cells on the opposite side. Of the three figures—the equal-sided triangle, the square, and the hexagon—which can be packed together without interstices, the hexagon is strongest and most convenient. To have the bottoms of the cells formed from three planes of adjacent cells on the opposite side economises labour and material. The amount of possible saving varies with the angle at which the three planes meet. Maclaurin showed by calculation that the angle of the bee-cell was mathematically the best. Though perfect regularity is disputable, there still remains a marvellous accuracy to be explained. On the one hand, some supposed, and one may almost say suppose, that the bees really know what they are about, and that they have by experiment solved the problem. On the other hand, others have tried to give either a mechanical or an historical explanation of the beautiful result. Thus Buffon sought to explain the hexagonal form as the result of the mutual pressure of crowded cylinders. He called attention to analogous results when soap-bubbles are crowded together, or when peas crammed into a bottle expand with boiling. While some, like Brougham, who have repeated this last experiment, denied that regular hexagons resulted, others have corroborated Buffon, and asserted that some of the figures formed are those of the bee-cells. Buffon's mechanical theory was, however, discredited, and indeed laughed at, by most authorities on bees, and the assumption which flattered the intelligence of these insects held ground till Darwin attacked the problem.

Darwin discussed the facts in the main from an historical point of view. He pointed out that at one end of a series the humble-bees either use their old cocoons for honey storehouses, or improve them slightly by the addition of short tubes, or build separate irregular rounded cells. At the other end of the series the hive-bees build their beautiful framework. But between these there are gradations, especially that exhibited by the Mexican *Melipona domestica*. This bee makes a comb of cylindrical cells for its young, and larger spherical cells for honey. These are placed so close that if the spheres were completed they would intersect. This is not, however, permitted, for the bees build flat plates between the cells which tend to intersect. Thus each cell presents an outer spherical portion and two or three or more flat surfaces. As one cell often rests against three others, a pyramid is formed by the union of three flat surfaces. Now if the *Melipona* made its spheres at a given distance from one another and of equal size, the result would be the hive-comb type. Darwin then resorted to experiment. He placed plates of wax in the hive, and on these the bees proceeded to excavate circular pits at equal distances, so that as they were completed the surfaces intersected. When this occurred, the bees built up flat walls along the lines of intersection. 'The work of construction,' he says, 'seems to be a sort of balance struck between many bees, all instinctively standing at the same relative distance from each other, all trying to sweep equal spheres, and then building up, or leaving ungnawed, the planes of intersection between these spheres.' Darwin thus called attention to the gradual evolution of the habit from less perfect expressions, and appealed, of course, to natural selection as tending to develop an instinct which was obviously economical of space, material, and labour. This account of the historical evolution of the habit does not, however, exclude the possibility of purely physical

factors having much more to do with the actual solution of the problem than Darwin supposed. A recent investigator of this much-debated point, Dr Müllenhof, reverts very much to Buffon's position. After emphasising the perfect plasticity of the wax at the temperature of comb-building (27° - 37° C.), he maintains that the beautiful result is not due to any artistic dexterity on the part of the bees; nor to any direct effect of their body-form, but 'to statical pressure according to the laws of equilibrium.' The cells are such as would naturally result from pressing the maximum number of cylindrical cells into the minimum of space. They really behave, he maintains, as softish cylinders would do in conditions of mutual pressure and continued plasticity. They form equilibrium figures with the smallest surface for given contact. But at anyrate it is, on the one hand, certainly gratuitous to credit the bees with the mathematical insight of senior wranglers, and equally unnecessary, on the other, to ignore the neatness and precision of their manipulation.

Into some of the cells honey is placed for winter use. In going up and down over the full cells, bees have been seen to protrude their stings, and to deposit drops of poison on the honey. This has an antiseptic influence, due to the presence of formic acid, without which the honey would ferment. In other cells pollen is stored after being salivated and compressed by indoor workers. A pollen-cell is (frequently at least) sealed with honey, and over this a thin cream-like pellicle is formed, which can be pushed aside for the deposition of more honey, or walked over without causing overflow. But of equal importance are the brood-cells, the cradles of the future young bees. These vary slightly in size. Those for future workers are smaller and lower; those for the drones are broader and longer. In spring-time, after the drones have begun to appear, the royal cradles are formed for the young queens. These cells are usually made at the edges of the combs, have their mouths turned downwards, and are of a large size and more irregular form. In other cases they are merely modified worker-grub cells.

Life-history.—As in the majority of insects, the life-history is divisible into four chapters—the developing egg, the larva or grub, the pupa, and the perfect insect. (1) The eggs have a long oval shape, and a whitish colour. They are, barring an exception already noticed, all laid by the so-called queen. After normal fertilisation she becomes, in fact, little more than an egg-producing machine, turning them out sometimes at the rate of 100 per hour or 3000 per diem, and is often fed while at her work, so that the expenditure of living matter is to a certain extent recouped. If a young queen be not impregnated in the first three weeks of her life, she continues laying drone-eggs only, as above described. The discriminative process of fertilisation of the ova is highly noteworthy: in laying an egg in a worker-cell the queen's abdomen has to be contracted, and a drop of seminal fluid is thus brought into contact with the egg; in the case of the larger drone-cell there is no such abdominal contraction, and consequently no fertilisation of the ovum. The egg is fixed by its end to the base of the cell, and thus it remains for between three and four days, when the worm-like grub appears. (2) The grub grows like any other insect larva, and as it touches the sides of its cell, coils up in a crescent, and floats in the food which has been left in the cell. As it gains strength, however, it rears up to the mouth of the cell and eagerly devours the food supplied by the nursing workers. After the sixth day the worker-grubs only receive unmastered food. The result is the stunting or atrophy of their reproductive

system. With the queen-grubs it is very different. The grub is seen literally wallowing in the rich and carefully elaborated royal jelly; and this abundant and stimulating nutrition is naturally believed to be the condition of the perfect development of the reproductive system exhibited by the queen-bees. (3) In several days, varying slightly with the season, the grub passes into another stage of its life-history. It has grown greatly and accumulated some reserve material to serve it throughout a period of fasting. The cell is sealed up by the nurses, and the grub becomes a *pupa*. The queen is $5\frac{1}{2}$ days a larva and $8\frac{1}{2}$ days a pupa, the worker 6 and 11, the drone 6 and 15 days respectively. The nursing workers seal up the cell with a cap of wax, which is more convex in the drone-cells, and in all cases different from the paler, somewhat concave, cover of the honey-cells. The imprisoned grub does not at once fall into inactivity, but proceeds first to spin its chrysalis-robes. Alternately contracting and elongating its body, it at the same time allows filmy threads to exude from the orifices of spinning-glands situated on its lower lip. There are two such organs, and the resulting thread which the grub weaves round itself is therefore double. In a day and a half the worker-grub has spun a complete cocoon, and becomes a true resting pupa or bee-nymph. The male-grubs also spin complete cocoons, but those of the queen-grubs only inclose head, thorax, and the first ring of the abdomen. In this connection it is worth noticing, as an illustration of depraved teleology, that, according to Hübner, the final cause of these incomplete cocoons is that the pupæ may be more readily exposed to the sting of the jealous first-born queen, whose instinct prompts her to kill off all possible rivals.

Within the curtain of the cocoon important changes occur. The mummy-like pupa is gradually modified into the young bee. The skin, the segments, the appendages, and the internal organs undergo most marked changes, and on the twentieth or twenty-first day after egg-laying the young insect finally bursts its swaddling-clothes, and emerges as a winged perfect insect or *imago*. They break open their cocoons with their jaws, and are assisted by the kindly workers; they clean themselves of moisture and shreds, and proceed to eat after their long fast. In some cases, after a preliminary meal, they proceed at once to gather honey, but the first flight is usually postponed for about a week, the intervening time being spent in indoor employment. The empty cells may be repeatedly used over again as cradles, or may be filled with honey. The young queens are not allowed to escape when their metamorphoses are over. In the door of their cell a small hole is made, through which the royal prisoners are fed till the tone of their piping probably intimates their complete sexual maturity. If the queen should be lost, and there be no royal grubs, a new queen may be literally manufactured. A young worker-grub is simply fed up to the required pitch in an enlarged cell of the proper spaciousness.

The different members of a bee-community enjoy lives of very varied duration. The drones live from May till August, but were it not for the massacre, would doubtless live much longer. Contrary to the opinions of the ancients, who credited bees with an existence of as much as six or even ten years, the workers seem to have in summer an extremely short but hard-working life, which probably averages about six weeks. Those born in autumn live on till the next spring, though many perish in the hard times of winter. A queen, on the other hand, will live from three to five years.

Diseases and Parasites.—There are several very

serious diseases of hive-bees, some due to bacteria, and another due to a protozoon in the same genus, *Nosema*, as the parasite which causes the silkworm disease (pebrine). 'Isle of Wight disease' has been traced to a mite (*Tarsonemus woodi*) inhabiting the first pair of spiracles. Bees are, like many other insects, subject to the attacks of parasites both on their bodies and within their nests. On the adult bee lice are common pests, while the larvæ of the ichneumon do great damage to the grubs; but the honey-bees are apparently exempted from the attacks of the latter. The adult honey-bee is greatly troubled by the Bee-louse (*Braila cæca*) and by the Bee-fly (*Phora incrassata*). The larvæ are often devoured by a species of beetle (*Trichodes*). A hairworm of white appearance occurs abundantly inside the drones only. The wild bees are similarly infested by numerous parasites, such as the larvæ of ichneumons, the minute *Anthophorobia*, which may be obtained in hundreds on breaking open a few cells of the leaf-cutter and other species. From larval intruders found in the nest of the wall-bee Lampert reared no fewer than nine different parasites belonging to the Hymenoptera, Coleoptera, and Diptera. Parasitism also occurs between bee and bee. Thus, the 'cuckoo-bees,' *Apathus* and *Nomada*, live at the expense of hosts no larger than themselves, with which, however, they seem to preserve a curious sort of harmony. On the other hand, the larvæ of *Stelis nasuta*, found in the nest of the Wall-bee (*Chalicodoma muraria*), seems to devour not only the food, but the lawful tenants.

Senses.—The sight of bees is well developed; they are able to distinguish objects at some distance, and show a marked preference for certain colours, as might be almost inferred from the history of bee-fertilised flowers. Lord Avebury showed by experiments with baits of honey on strips of paper of different colours that they can distinguish green, yellow, red, and blue, and prefer blue to all. Pink also appears to be a favourite colour. Like other insects, they are attracted to light. Much has been observed in regard to the power bees have of finding their way straight home. Avebury's careful experiments have shown that the so-called 'sense of direction' is not in all cases a sufficient guide, but must be aided by definite registering of landmarks over the space traversed. This they are certainly able to do, and they can also remember their visual impressions for a considerable time. The sounds made by bees at their respiratory openings or stigmata are not restricted to a monotone, but vary considerably, as in the familiar case of the responses of the queen-bee to the piping of the princess pupæ. From the variable sounds, apparently expressive of emotion, it has been inferred that bees are also able to hear. Lord Avebury was, however, unable to get them to take any notice of any sound which he could devise, though he was disposed to believe that they can hear higher notes.

Some of the mouth parts, such as the inside of the tongue, evidently act as organs of *taste*, and are able to discriminate between different kinds of nectar. Bees have also an acute sense of *smell*, but how far this is physiologically separated from taste is uncertain. It is probably by a fine sense of smell that bees are able to recognise the members of their own hive, and to detect an unwary wanderer or thievish intruder of another house. Sprinkling them with some strong scent appears naturally to obliterate this power. In connection with the recognition of strange bees, it is worth while quoting Mr Langstroth's observation that a stranger laden with honey is received with open arms, while a hungry marauder is very summarily dealt with. 'There is,' he says, 'an air of roguery

about a thieving bee which, to the expert, is as characteristic as are the motions of a pickpocket to a skilful policeman. Its sneaking look, and nervous, guilty agitation, once seen, can never be mistaken.

Lord Avebury's experiments have shown that bees possess a certain power of communication, and other observers also, such as Fritz Müller, have recorded cases where the workers were able in particular ways to bring their friends to some treasure-trove, or in some way told one another the sad news of the loss of their queen, and the like. How they can communicate any definite impression to their fellows is a mystery, but observers have noted that they tap one another with their feelers, and that the notes emitted from their respiratory apertures differ somewhat in character. The antennæ are most essential organs of sensation; and an animal deprived of them exhibits a high degree of bewilderment and incapacity virtually amounting to insanity.

Intelligence.—Bees have thus keen sight, enabling them to distinguish objects and colours; acute smell, quick to detect, for instance, stranger bees or attractive food; and presumably a fine sense of hearing, fit to discriminate between the import of slightly varying tones in one another's voices. But they have more, inasmuch as they exhibit in their actions what can only be fairly described as intelligence. Without entering into any discussion, it may be useful here to recall the rough distinction between those instinctive reasonable actions which have become habitual, and those which exhibit a power of accommodation to new conditions or change of habit in the face of new problems. This whole subject, so far as at present understood, is well discussed in Romanes's *Animal Intelligence and Mental Evolution*, on the first of which the following summary is based. To begin at a comparatively low level, bees exhibit indubitable instances of *memory*. They are not only able accurately to register visual impressions of a locality so as to be able to find their way thither, even after considerable intervals, but they can associate their impressions so as to be able, for instance, to recognise a human friend, and have in some cases been tamed and trained. Lord Avebury also tells how a bee remembered what it had been shown—that the way out of a bell-jar held with its closed end against a window was not to endeavour to get through the pane, but out at the open end.

It is obvious further, from what has been already said of the habits of bees, that many features in their domestic and social economy suggest foresight and purposeful determination. Such a conclusion must, however, be made with great caution in regard to all actions or sets of actions which are distinctly habitual and shared by the whole race. That several surplus queens are reared to make up for losses; that worker-grubs can, if occasion demand it, be promoted by feeding into queens; that the young queens are not liberated till the old one leads off her colony, and then generally in gradual succession; that the workers allow the rival queens to settle their own affair by duel in which the fitter probably survives; that they massacre their drones when these are no longer of use; and that they do a dozen similar things, is doubtless marvellous, but the marvel must not at least be exaggerated by forgetting that they have been forced and drilled into these reasonable habits throughout the very long history of their social organisation. On the other hand, when an unusual juncture in the social relations occurs, and the bees act sagaciously in extraordinary conditions, then there is purposeful intelligence to admire. Thus Romanes quotes two observations of F. Hübner to the following effect:

Two sole surviving queens, prompted by their instinctive jealousy, were engaged in mortal combat, and were so situated that a simultaneous double sting would end the life of both—an obvious disaster to the hive. They released one another, and intelligence triumphed over instinct. And again, a hive was left queenless, with the not uncommon result that the remaining bees set about manufacturing some new queens from worker-grubs. Hübner restored the old sovereign, and the bees at once proceeded to remove the royal food from the worker-grubs, so as to counteract their previous, but no longer useful intention of rearing new queens. The submission of the bees of an invaded hive when they find that their queen has been killed, is also a curious instance of discretion, and the variations occasionally exhibited in connection with drone-killing, are no less suggestive of intelligence. Again, it is a fact, which any one can verify, that bees bite through the corollas of many tubular flowers near the nectaries, in some cases as a lazy trick to save time, in other cases as an ingenious device to reach nectar inaccessible by the normal process of stretching the proboscis down the corolla tube.

The careful *ventilation* of an over-heated hive is evidently an adaptation to an abnormal state of affairs which would not occur in the roomy natural hives, and ought not to occur in the artificial. 'It follows,' Büchner writes, 'that the fanning and ventilating can have absolutely nothing to do with an inborn tendency or instinct, but have been gradually evoked by necessity, thought, and experience.' In regard to *cleanliness* also, intelligent adaptations of much interest are exhibited. When possible, the excrement is voided outside; in winter the fæces may be retained till the first fine day; bees have even been known to make a kind of drain for the removal of the waste matter, which, when voided in the hive, often causes dysenteric and other fatal diseases. Small intruding animals, such as slugs, are known to be sealed up with propolis, while an intruding mouse, for instance, too large to be safely left in this way, was killed, and gnawed into bits, which were carried piecemeal outside. The bodies of deceased bees are also removed outside the hive. In regard to their *treatment of intruders*, besides the welcome of those bearing gifts, and the rough detection of those with evil intent, their clever device by which they fortify the hive against their formidable enemy the death's-head moth is extremely suggestive. Hübner was the first to notice that, as the result of repeated attacks, the bees were taught by sad experience to build at the entrance a barrier of wax and propolis, with a hole large enough to admit them and small enough effectually to exclude the invader. Whatever opinion may be held in regard to the intelligence displayed in the habitual *architecture*, there can be little doubt as to the inference to be drawn from cases in which the building habits are modified to suit peculiar conditions. Bees have been seen to make repeated trials of different plans in special cases, as when two combs meet at an angle, to pull down bad workmanship and rebuild it, to adopt ingenious devices when the sides of the hive were made of smooth glass, and so on. To Hübner 'the purest reason seemed to shine out' from the action of the bees in a hive where a piece of comb fell from its proper position. Wiser than many builders, they strengthened the attachments of all the other combs, 'clearly because,' as Romanes notes, 'they inferred that they too might be in danger of falling.' Many similar instances have been recorded.

Emotions.—The intellectual development associated with the complex social relations of bees seems much greater than the culture of their emotions.

Sir John Lubbock describes them as 'thoroughly callous and utterly indifferent to one another,' except, indeed, when attention to their comrades was for their own advantage, or part of the ordinary business of their life. He notes how they pay no regard whatever to the sudden death of a comrade beside them, nor even to the struggles of one in trouble. Other observers, both ancient and modern, give them credit for a little more sympathy, and have noticed cases, perhaps exceptional, where they did seem to exhibit active compassion for an unfortunate fellow-worker.

Relation to Flowers.—It is now well known that in the majority of flowering plants the female cell is fertilised by male elements or pollen grains carried by insects from another flower of the same species. Insects, more especially bees, and flowers have, in fact, grown up together in mutual dependence and with mutual influence. They have perfected one another. Bees are attracted to suitable flowers partly, no doubt, as the result of experience, but also by odours, and especially by colours.

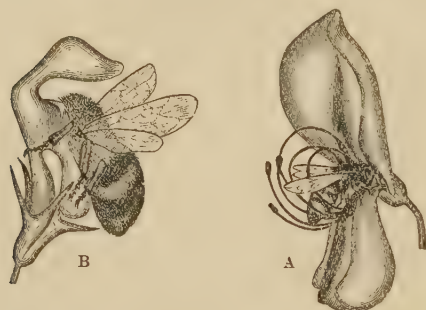


Fig. 5.

A, Honey-bee on broom-flower; B, Wild-bee on white dead-nettle.

These colours exhibit a gradual evolution from yellow to blue. They 'follow a regular law of progressive modification, but have been fixed and stereotyped in each species by the selective action of the proper beetles, bees, moths, or butterflies.' Blue colour is characteristic of many highly-developed flowers, and bees are especially fond of this blue colour, probably because they have learned to associate it with flowers peculiarly suited to their access and taste, and the result of this preference is to insure the fertilisation and survival of the higher flowers. And again, numerous flowers, especially those visited by the higher bees, exhibit mechanical adaptations which insure that the bee in diving down for the nectar becomes thoroughly dusted with pollen. The wild sage (*Salvia*) and the orchis are two good examples of very different modifications securing fertilisation. There can be little doubt that at least the more mechanical of these pollen-dusting contrivances have resulted as direct adaptations in association with the continual visits of bees. See FERTILISATION OF FLOWERS.

Pedigree of Bees.—These adaptations are, however, mutual ones: just as flowers have been modified in relation to bees, so have bees in relation to flowers. Bees thus appear to be the last result of a long series of progressive changes, the steps of which are still to some extent discoverable. According to Hermann Müller, the primitive ancestor was a form like the common sand-wasp, carnivorous in its diet, and bringing its insect or spider prey to its larvæ. From these arose forms which adopted a floral diet, and thus filling up a more or less unoccupied corner in nature's household, got on amazingly well. They thrive, were

fruitful and multiplied, and were, in the course of time, likewise modified into the numerous types of modern bees. The chief modifications, as above noticed, are associated with the development of social life, the elaboration of honey-sucking mouth structures, and the equipment with pollen-collecting appliances. Müller's main stages are as follows:

(1) Starting from the sand-wasp, we find in *Prosopis* a bee but slightly advanced above the ancestral type. It is almost hairless, with mouth parts but slightly elongated, and feeds its young on honey and pollen, which are simply crammed into the brood-chamber. (2) *Sphecodes*, *Halictus*, and *Andrena* occupy a somewhat higher level. They are more efficient pollen-collectors, inasmuch as they have become hairy. In the first there appears the first trace of feathery-collecting hairs, and the primitive fashion in which they feed the young with the disgorged surplus of food is also interesting. *Halictus* has more hairy hind-legs, and special brushes on some of the terminal joints. The young are fed with pollen. In *Andrena* the whole hind-leg is hairy. (3) *Dasypoda* and *Panurgus* exhibit yet another step in the direction of more efficient pollen-collecting. The hairs occur on the long tibia (second-last portion) and on the terminal part or tarsus. (4) The last step in this direction is exhibited by those forms in which the pollen is moistened with honey before it is stowed away. In *Macropis*, heaps of consolidated pollen are fixed without special contrivance to the hind-legs; in *Bombus* (humble-bee) the outer side of the hind-legs exhibits the familiar pollen-basket fenced in with long hairs—an obvious economy of both hairs and time; while *Apis* (honey-bee) shows a yet more evolved arrangement of collecting-brushes and receiving-basket. Besides those forms with collecting-hairs on the hind-legs, culminating in *Apis*, there is a separate division, in which the pollen is collected on the lower surface of the abdomen upon brushes or backward-directed bristles. The mason-bee (*Osmia*) and the leaf-cutter (*Megachile*) are good examples. In the same way, Müller traces throughout a series of gradations the evolution of the honey-collecting organs. This progress is chiefly concerned with the lengthening of the tongue and the extension of the membranous and elastic parts between the bases of the two pairs of maxillæ (between mentum and cardines). The tongue is in the lower bees decidedly shorter than the basal joint or mentum, but ends with becoming very much longer. The first pair of maxillæ also elongate into insheathing laminæ for the tongue, and the same is true of the proximal joints of the labial palps (i.e. of the external lateral portions of the second pair of maxillæ). In power of extension and retraction, in equipment with honey-catching hairs, in the differentiation of a terminal lobe, &c., the tongue exhibits a progressive evolution.

Evolution of Social Life.—Just as among ants, so with bees we have to distinguish solitary and social genera, of which the former are greatly in the majority, and, in origin at anyrate, the more primitive. Starting from completely solitary forms, we next find bees whose nests are individually separate, but at the same time closely adjoin those of their neighbours. From such a beginning the various grades of development up to the complex social life exhibited in the communities of humble and honey bees are still distinctly traceable.

(a) *Solitary Bees.*—*Colletes* is a common and widely-distributed genus, the females of which closely resemble the common honey-bee. The males differ in several features, and are decidedly

smaller. They form colonies of considerable size in loose soil or in the soft mortar of walls. Each cell is lined with a fine coating resembling gold-beater's skin. *Prosopis* is also a common bee of wide distribution. It closely resembles a sand-wasp, and is destitute of the usual means of carrying pollen, being on that account long regarded as a parasite. They make their cells in the pith of bramble-sticks, and line them, like *Colletes*, with a delicate membrane. The British species appear in June, and continue during the two succeeding months. When handled they give off a pleasant odour. The genus *Sphecodes* includes four British species, of world-wide distribution, but of infrequent occurrence. They also are often regarded as parasites on other bees (*Halictus*), but Mr F. Smith's observations go to show that both in burrowing and pollen-gathering they are entirely independent. The nests occur, indeed, side by side with those of *Halictus*, but each bee seems to keep to its own home. In spring females alone are met with, while in autumn both sexes occur together. The genus *Andrena* is the most numerous of all the *Apidæ*, the British species alone numbering sixty-three. They have been fitly called the harbingers of spring, as they appear even in the cold of March. They are all burrowers, making holes which measure from 6 to 12 inches in depth, and give off lateral passages, each terminating in a cell. In this the female deposits its egg on the top of a mass of pollen about the size of a pea. After devouring this, the larva falls into a lethargy, which lasts till the following spring, when the rest of the metamorphosis is rapidly completed.

Halictus is a large genus, the members of which resemble *Sphecodes* in many characteristics, and in this among others, that they alone among solitary bees are impregnated in the autumn, and remain dormant during winter. The most beautiful bees found in Britain are the wasp-bees or *Nomada*. In their gay colours they resemble wasps. They are widely distributed in the northern hemisphere. Their life-history is still veiled in obscurity, little being known beyond the fact that they enter the hives of other bees (*Andrenidæ* and *Apidæ*). All the British species emit when captured very agreeable balmy odours. The mason-bee, or *Osmia*, includes a large number of species with most interesting diversity of instincts. They occur abundantly in temperate climates, and their nests are found in the most diverse localities, from the shells of snails to the branches of brambles. In regard to these wood-boring bees (such as *Xylocopa*), it has been a commonly received opinion, originating with Réaumur, that the young forms at the lowest portion of the excavated tunnel escaped first, and that the others followed suit in regular order from below upwards. Each young bee had thus simply to cut its way through the bottom partition of its cell, towards which its head was said to be pointed, and was thus not only saved trouble, but kept from disturbing the less mature inmates of the upper stories. This pretty observation is, however, denied by Mr Smith, with respect to the numerous British wood-boring bees. *Megachile*, the genus of leaf-cutters, is the most cosmopolitan of all genera of bees, and three hundred species are known to exist. They all excavate burrows in the ground or in wood, which they line with cuttings from the leaves or petals of flowers. *Anthophora* is a very numerous genus, of world-wide distribution, and includes one hundred and thirty species, of which four occur in Britain. Some of them are true carpenters, and others are burrowers.

(b) *Social Bees*.—The genus *Bombus* includes one hundred species, of which twenty are British. Of all the wild bees, the species of *Bombus* (humble-bee) are the most familiar, being extremely conspicuous on account of their large size

and noisy hum. In different parts of the country they receive different names, such as bumble-bees, hummel-bees, dumble-dores, foggie-bees, &c. Some species build their nests on the surface of the ground amongst moss and grass (e.g. *B. muscorum*, *B. pratorum*, and *B. elegans*), while others form subterranean homes (e.g. *B. lapidarius*, *B. subterraneus*, *B. virginalis*). At the first approach of spring, the females, which have been hibernating, come forth from their retreats, and at once set about establishing a homestead, choosing for instance the deserted abode of a shrew, or simply looking for a cosy nook on the surface. Having found a convenient site, the bee builds a nest of withered grass, moss, &c., in the centre of which a mass of pollen mixed with honey is then deposited. On this she lays several eggs, side by side, and covers them over with pollen. When the eggs hatch, the larvæ eat their way in different directions into the surrounding store until they reach their full growth, when they spin for themselves a strong oval cocoon. At the side of the mass are a set of shallow receptacles containing coarse liquid honey. These are probably designed either for the moistening of the pollen, or as a store for a rainy day. Within the cocoon the larvæ soon become perfect insects, but are not on emerging ready for active work, nor equipped with their full-coloured dress. The empty cocoons afterwards serve as store-chambers. The workers appear to issue first, and to take upon themselves the entire maintenance of the colony, while the queen now restricts herself more or less completely to maternal duties. Along with more workers small females appear, which are not unnaturally supposed to be only capable of producing drones. Later on the drones appear, while the last brood consists solely of large females, which, on being fertilised, hibernate, and thus complete the life-history.

The industry of the humble-bees appears to surpass that of any other bees, which is saying a great deal. From the earliest morning till the last streak of evening light, they seem to continue most indefatigably at work. The temper and courage of the different species varies very considerably; the nests of the surface-bees are readily taken, while the underground homes can hardly be outraged with impunity. No species is more courageous than the red-backed *B. lapidarius*. In autumn, however, the courage seems to wane, and a general listlessness prevails; the males especially being often found on the heads of thistles and other composites in a dazed and helpless state, capable only of twisting their legs over their head and back in a beseeching fashion, this condition being more probably due to the stupor caused by cold, than to over-indulgence in nectar. *Bombus* has a curious semi-parasitic double-goer, called *Apathus*, which is a very shadow of its host, and is thus able to enter the nest without molestation. The parent deposits her eggs in the pollen of a humble-bee nest, the larvæ are reared with those of the latter, and the adults enter and leave the nest as if perfectly at home. The association is by no means a friendly partnership, for the aristocratic idlers gather no pollen, and prey upon the innocent *Bombi* with which they live. They consist entirely of males and females, are veritable 'cuckoos,' and do no good to the flowers which they may visit.

Different Kinds of Honey-bees.—The genus *Apis*, to which the hive-bee (*Apis mellifica*) belongs, has a cosmopolitan distribution, and numerous local varieties have arisen in response to peculiarities of habitat and nutrition. The number of true species is a point of considerable debate. The fifteen enumerated in the General Catalogue of *Apidæ* published by the British Museum, have

been reduced by Mr F. Smith to nine—viz. *A. dorsata* (India, Borneo, &c.), *A. zonata* (Celebes), *A. indica* (India, Java, Sumatra, &c.), *A. nigro-cincta* (Celebes, Borneo, &c.), *A. sinensis* (China), *A. florea* (India, Ceylon, Borneo, &c.), *A. adansonii* (Africa), *A. unicolor* (Madagascar, Rodriguez), *A. mellifica* (cosmopolitan). Of the last there are several varieties.

Within the limits of this article it has not been possible to do more than touch on some of the most important facts in regard to bees. Enough, however, has been said to show that the perfected complexity of their social state, the marvels and mysteries of their family relations, the exquisite adaptations of their structure, the dexterity and intelligence of their work, and the part they have played in the history of flowers, justify us surely in sharing the enthusiasm of those who, from the time of Aristotle downwards, have gained in the study of these insects some insight into the wonder and beauty of nature. See ANTS, FERTILISATION OF FLOWERS, HONEY, HYMENOPTERA, INSECTS, WASPS, &c.

BEE-KEEPING as a source of profit has largely extended in recent years, owing to the improvement of modern appliances, and the more thorough knowledge of the habits of the honey-bee. The only species of bee cultivated in Europe for its honey-gathering powers is the *Apis mellifica*. Different varieties have been tried, but those now in more common use are the Italian bee, the Carniolan, the Dutch (said to be immune to Isle of Wight bee disease), and the common black bee of the country. Opinions differ as to the value of these races, but probably quite 85 per cent. of British bee-keepers consider the black bee the most profitable and suitable for this country. Some of the other races are too vicious, and others too much given to swarming. A good honey-gathering bee is produced by crossing some of the varieties, but its temper is usually uncertain.

In Italy and elsewhere queens are raised on a large scale, put into small cages along with food and a few bees, and transmitted through the mails all over the world. In consequence of this, in some parts of the country it is difficult to find absolutely pure black bees.

Hives.—It is necessary to the well-being of a colony of bees that their hives should protect them from the changeable influences of the weather. While the hive should be light, so as to be easily moved about, its walls should be thick enough to protect the bees from the extreme cold of winter and the excessive heat of summer, and should be constructed of a material that will effectually protect them from rain, cold, or damp. The hive in use in Britain for ages past has been made of straw, sewed tightly together with narrow belts of cane or bramble. The straw-skep answered the purpose of its construction very well, being light, comfortable, and durable, and formed a picturesque object. The straw-hive is unknown in America, the frame-hive, and sometimes a wood box being the only forms known. In Russia round logs of wood, hollowed out in the centre, are largely used. The introduction of the movable comb method of management has made the skep give way to what is known as the frame-hive; and now in many parts of Scotland and England the straw-skep is looked on as a relic of the past. The principle of the movable comb hive is of very ancient origin, having been employed by the Greeks; but it has been reserved to our own times to develop it. To the Rev. L. L. Langstroth, an American bee-keeper, belongs the credit of conceiving a hive in which the combs are built in frames hung side by side in a box. The Langstroth hive made its appearance in the United States in 1851, and since then profitable bee-keeping has advanced

rapidly. The great advantage gained by the movable comb system of management is that the capacity of the hive may be regulated to accommodate any number of bees, however great or small.

As winter comes on, and the bees decrease in number and cling more closely together, the hive is contracted by means of one or two division-boards, so that the internal heat is economised. As spring advances comb by comb is added until the hive is full. Other advantages of the method are that weak hives may be strengthened by combs taken from more prosperous colonies, so that the drone-producing powers of the colony may be regulated, that on signs of anything having gone wrong in the economy of the hive the bee-master may be able to detect the cause and to effect a remedy, and that the hive is so simple in construction as to be easily put together by any amateur joiner.

The frame known as the British standard, made of four bars of wood joined at the corners, is 14 inches long, $8\frac{1}{2}$ inches deep, and is made of wood about $\frac{3}{8}$ inch thick.

If one examines a skep in which the bees have been allowed to work at will, it is found that the combs are about an inch in thickness, and hang at a distance of about

$\frac{1}{2}$ inch from one another. Accordingly the frames are made $\frac{3}{4}$ inch broad, and are hung at a distance of $1\frac{1}{8}$ inch centre to centre. It has been found, however, that spacing the frames $1\frac{1}{2}$ inch centre to centre during the summer months gives ample room for raising worker-brood, but prevents the overproduction of drones, and this spacing is much resorted to. The number of frames depends on the size of the swarm to be accommodated, on the prolificness of the queen, and the honey-yielding capabilities of the district. Ten or eleven frames are usually sufficient where an ordinary black queen is in use, but many bee-keepers use as many as fifteen for those of a more prolific race. A hive, then, containing ten frames must be 16 inches long, which will allow $1\frac{1}{2}$ inch for two division-boards, $14\frac{1}{2}$ inches broad (front to back), and 9 inches deep. A passage of $\frac{1}{4}$ inch is allowed at the ends of the frames, and $\frac{1}{2}$ inch under the bottom bars of the frames. If more than this is given the bees will fill up the space with comb, and if less will be attached with propolis to the walls of

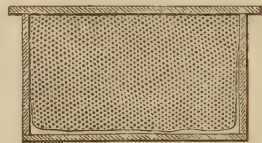


Fig. 6.—A Frame filled with Honey-comb.

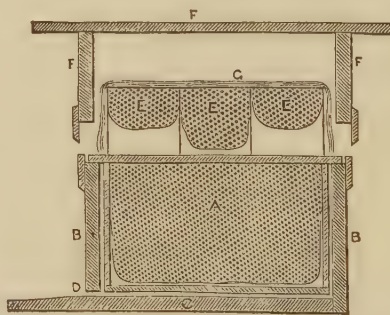


Fig. 7.—Section of Frame-hive.

A, frame with brood-comb; B, walls of hive; C, floorboard; D, doorway; E, section of super for surplus honey; F, cover of hive; G, quilt.

the hive. The box thus constructed is the brood-chamber and storehouse of the bees, and is never despoiled of its sweets. It is necessary to provide accommodation for the storage of the surplus honey,

of which the bees are to be deprived. Bees in their wild state store the honey above the brood-combs; accordingly a box of corresponding dimensions is fitted above the hive, while the whole is protected by a sloping roof. A thick warm quilt is placed over the brood-frames in winter, and in the summer is removed and placed over the surplus box. A doorway is provided the full length of the hive and $\frac{3}{8}$ inch in height, and a suitable floorboard completes

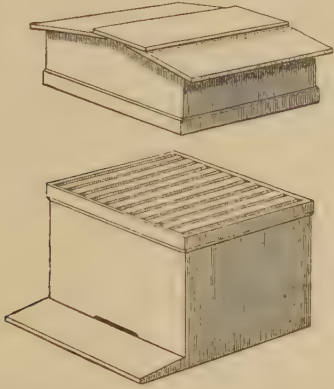


Fig. 8.—Frame-hive with cover raised to show arrangement of frames.

the hive in its simplest form. Such a hive, however, is better to have further protection from extremes of heat and cold, and the one in general use consists of a light inner case to contain the brood-frames, placed in an outer case, both cases being made of wood $\frac{1}{2}$ inch thick. A 'lift' or 'eke' is also used for convenience in winter packing and to admit of two or three tiers of surplus sections being placed over the frames at the same time; otherwise too many swarms may result. Though the frames thus are hung at regular intervals, the bees would almost always work their combs irregularly on them, and the advantages of the frame-hive would be lost. To obviate this, guides are fixed to the under side of the top bar. A septum of wax, invented in 1857 and improved in 1876, is now inserted in the frame. This is known as 'comb-foundation,' and consists of a thin sheet of wax impressed in a machine on both sides with the form of the base of the cells. The bees take to this at once, and work combs of perfect regularity and flatness. The strips of foundation used may be of any breadth from $\frac{1}{2}$ inch to the full comb. By using full sheets the bee-master is able to control the birth of drones in the hive, for, if foundation bearing the impress of worker-cells be used, the comb will necessarily be capable of containing only worker-brood. The bee-keeper is thus enabled to assist nature in preserving the fittest by breeding drones from his best queens only, and, further, if full sheets are used the bees furnish their house in one-third the time it would otherwise take.

Quieting Bees.—Every one who has any knowledge of bees knows how rarely bees sting whilst swarming. This is owing to their being gorged with honey, when a bee will not sting unless hurt. If, then, the bees can be made to fill themselves with honey, they are in the bee-master's power. The general method of attaining this end is by blowing amongst them a little smoke. This may be done by a miniature bellows called the 'smoker,' in which a piece of cotton or other substance is kept smouldering and an occasional whiff of smoke used. A puff from a tobacco-pipe also serves the purpose. The bees, frightened by the smoke, seem

to fear that they are about to be driven from the hive, and they run to their store and gorge themselves, as they do preparatory to swarming, and in a minute they may be handled at will.

Swarming.—A pound weight of bees contains about 4500 individuals, and swarms usually weigh from 4 to 8 lb. A good stock during the summer, however, may contain 70,000 or 80,000 bees. In spring the number is much smaller, amounting to only a few thousands. As the season advances and becomes warmer and food more abundant, the queen deposits her eggs more and more rapidly, attaining in the height of the season a rate of 2000 to 3000 a day, and the colony soon becomes too numerous for the limits of their dwelling unless special room is provided. Swarming of the bees may be almost wholly prevented by providing sufficient accommodation and ventilation for the increasing numbers. In Scotland swarming rarely commences before the close of May, while in the south of England it is a few weeks earlier. The chief indications that a swarm is about to issue are the clustering of the bees at the entrance of the hive, and a cessation of the usual activity amongst the community. Previous to swarming, the bees gorge themselves with honey (this applies to a first swarm only) that they may have some store of provision for their new home. A first swarm will rarely leave the parent hive in bad weather. The time usually chosen is the early part of the forenoon, though a swarm has been known to come off as early as seven in the morning and as late as five o'clock in the afternoon. The bees pour from the hive in a constant stream. The swarm is not led forth by the queen, as is generally supposed, for she is sometimes seen to issue with the stragglers at the close. They fly round in circles until the whole have left the hive, filling the air with a pleasant hum. Gradually a knot of bees is seen to gather on some bush or tree close at hand, and this knot increases in size until the whole swarm has joined it. If left to themselves they will remain at rest for an hour or more, when they will again take wing and go off in a 'bee-line' to some chimney-top or decayed tree that has previously been decided on. As soon, however, as the cluster is complete the bee-keeper proceeds to skep the swarm, which he does by placing a straw-skep over it, and allowing the bees to crawl up of their own accord; or he may hold the skep under the cluster, and give the branch a sudden shake, when almost every bee will fall into the skep. He then shakes them into the frame-hive, which is either left till evening where the cluster has gathered, or is removed at once to its permanent station. Previous to swarming, the rearing of half-a-dozen or more queens has been commenced. Eight or ten days after the swarm issues the most advanced of these queens comes to maturity, and issues forth from her cell. Her first impulse is to destroy the remaining royal grubs. If the hive be of sufficient strength to swarm a second time, the worker bees keep guard over the cells, when the newly hatched queen takes flight with a second colony. Unless increase of stock is aimed at, second swarms should be avoided, and when they do emerge should be returned to the hive, after all the remaining queens or queen cells have been destroyed.

Artificial Swarming.—As has already been noticed, a swarm left hanging in its original cluster will go and establish a home for itself. The hives during the swarming season must therefore be carefully watched. To avoid the necessity of continually watching for swarms and the chance of losing them, as well as for other sufficient reasons, methods of artificial swarming are now practised by all advanced bee-keepers. This is a process easily accomplished, especially

with the movable frame-hive. An empty hive is placed on the site of the colony to be swarmed, which is itself moved aside. The frames of bees are then lifted out and examined one by one until the queen is found, when she, along with the bees and the frame, is placed in the empty hive on the original stand. One or two additional frames of brood and honey are placed along with it, and the hive filled up with frames in which full sheets of foundation have been inserted, and covered up as before. Empty frames also take the place of those removed from the old hive, which is taken to a new situation in the garden when the work is complete. The operation should not be gone about until the old hive is pack-full of bees, and if done about the middle of a fine day all the bees on wing during the operation, as well as all the old bees in the swarmed hive, will make their way to the new hive on the old site. The bees in the original hive will at once set about raising a new queen for themselves, but it is far better and more profitable to supply them the following day with a fertile queen. In the case of swarming from a straw-skep the simplest plan is, when it is quite full of bees, to place underneath it a hive containing old combs or frames filled with foundation, and cover all up as warmly as possible. Probably in a week the bees will be found working in the new hive, and if the frames are then examined and the queen found on them, the old skep may be removed to a new position. If a fertile queen is available and it be given to the old stock the following day, it will soon be in a condition that the operation may be repeated if increase is desired.

Feeding.—A stock should have at least 30 lb. of stores for winter use. All stocks should be examined in September, and any found deficient in stores rapidly fed up before the cold weather sets in. With a suitable feeder this may be accomplished in a few days. Syrup for winter food is made by bringing 6 lb. of sugar and 3 lb. of water to the boiling-point, and then adding a tablespoonful of vinegar to prevent the syrup from recrystallising in the combs. For spring use equal quantities of sugar and water may be used. Where feeding is necessary during winter or early spring a soft candy is used, and is made by bringing 10½ lb. of sugar and 3½ lb. of water to the boil, and then adding ½ oz. of cream of tartar and continuing to boil it until a temperature of 245° is reached. The mixture requires to be continually stirred until it begins to turn white, after which it is poured into moulds. Gentle feeding in late spring with syrup is often advisable, and cheap suitable feeders for the purpose are on sale.

Getting the Honey.—In olden times the invariable method pursued in this country of taking the honey was by allowing the bees to work at will in small straw-skeps until the close of the season, when they were destroyed by sulphur-fumes. This has almost everywhere now given place to a more humane method of management. A method adopted by advanced bee-keepers is what is known as 'extracting,' and is only possible in the movable comb hive. A box of equal dimensions to the body of the hive, and filled with frames usually 5½ inches deep, is placed over the brood-frames. The quilt is removed, and its place is taken by a sheet of 'excluder zinc'—viz. zinc with perforations large enough to allow the worker bees to pass freely through, but effectually bar the progress of the queen and drones. The upper story is thus kept free from brood, and the honey got is pure. When this box is full it is removed, and an empty one put in its place or underneath it. As soon as removed from the hive the capping of the cells is then cut off, and the frames are put into a machine known as the 'extractor.' This is a large cylinder containing

wirework cages that may be set in rapid rotatory motion. The centrifugal force throws out the honey, and the empty combs are replaced on the hive to be again filled by the bees. By this method of working the bees are saved the labour of comb-building, the large amount of honey required to form the comb, and large harvests of honey may be secured. As much as 400 lb. has been taken from a single stock during one season in this way. It should be noted that heather honey, being of a thicker consistency than flower honey, cannot be extracted in this way, but is taken from the comb by means of a 'heather-honey press.'

Another method is to fill the upper story of the hive with boxes of thin wood, known as 'sections,' placed side by side. The sections are usually made to contain 1 lb. of honey, and are fitted like the frames with guides of comb-foundation, which, however, is made much thinner than for the brood-frames. The advantage gained here over the old method of producing large supers is that the surplus chamber, like the hive, may be enlarged or contracted at will, and that the honey is secured in a more convenient and saleable form. To keep the bees in room and prevent too many swarms the plan usually adopted is to place a second box of sections under the first put on as soon as it is half-filled. The quantity of honey that may be taken from a hive differs with the locality as well as with the season and the strength of the colony. In a good season a populous colony may yield from 60 to 100 lb. of comb-honey, besides laying up a sufficient store to keep them through the winter, while if the extracting system be followed nearly double this amount may be secured.

The honey of various regions is flavoured by the flowers predominant in the districts where it is gathered—heather, white clover, fruit-blossoms, lime-tree, &c. In Scotland it is not unusual to transport the hives in the flowering season to the neighbourhood of heathery tracts. The honey most famous in the ancient world was that of Mount Hybla in Sicily and Mount Hymettus in Attica. Supplies are imported into Britain from various quarters; but it is to the United States and Canada that we must turn for bee-farming on the largest scale, and California, especially southern California, is the paradise of bee-keepers.

In 1913 there were said to be 10,000,000 hives in the United States, kept by 1,000,000 persons, of whom 6000 were professional bee-keepers. Some bee-keepers have from 2000 to 4000 hives, and as much as 400 lb. of honey has been obtained from a single hive. The most improved hives, honey-extractors, and appliances are in general use. See ADULTERATION, HONEY, WAX.

For further information, consult E. Bevan, *The Honey-bee* (1827; 2d ed. 1838); F. Huber, *Nouvelles Observations sur les Abeilles* (2d ed. 1814); Kirby and Spence, *Introduction to Entomology*; Kirby, *Monograph of British Bees*; L. Langstroth, *Hive and Honey-bee*; Lord Avebury, *Ants, Bees, and Wasps* (1882); Tickner Edwards, *The Lore of the Honey-bee* (1908); P. E. Schmiedeknecht, *European Bees* (1887); Smith, *Bees of Great Britain*; T. W. Cowan, *The Honey-bee and The Bee-keeper's Guide-book* (1913); Müller, *Fertilisation of Flowers* (Eng. ed. by D'Arcy Thompson, 1883); Maeterlinck, *The Life of the Bee* (trans. 1901); Roots, *ABC and XYZ of Bee-culture* (1913); Cowan, *British Bee-keeper's Guide* (1913); Digges, *Practical Bee Guide* (1910); Simmons, *A Modern Bee Farm* (1913); Cheshire, *Bees and Bee-keeping* (i. scientific, ii. practical, 1886-88); Millar, *Forty Years among the Bees*; Doolittle, *Scientific Queen-rearing*; Dzierzyn, *Rational Bee-keeping* (1882); Bonnier, *Les Nectaires* (1879).

Beeberu. See GREENHEART.

Beech (*Fagus*) is an important genus of the natural order Fagaceæ, to which also belong the Oak (q.v.) and the Chestnut (q.v.). There is

only one species indigenous to Europe, the COMMON BEECH (*F. sylvaticus*), which has from time immemorial grown spontaneously on the chalk hills throughout southern and central England, but was only introduced into Scotland and Ireland early in the 18th century. It differs from oak and chestnut in having its female flowers in separate terminal bunches, in having male catkins with a long petiole hanging down from the side, and in having for its fruit a hard prickly involucre opening in four valves, and containing two or three three-cornered, sharply pointed nuts ('mast'). It is a tall tree, attaining a height of 90 to 100 feet, and a large girth when growing isolated in parks, and has a straight trunk with smooth gray-green bark and large densely foliaged head. The leaves are ovate, glabrous, entire or obscurely toothed, pale green and ciliated along the edge while young, but afterwards becoming tougher and darker. The beech is indigenous to most of the temperate parts of Europe, and forms large forests in France, Germany, Austria, and the southern parts of Russia. In Scotland its northern limit of spontaneous growth is between 56° and 57°, but it extends to over 60° in Norway, and trends S.E. across Europe. It is still the most characteristic tree in the woodlands on the Chilterns and the hills in Bucks, Berks, Dorset, Hants, and Wilts; but as a forest tree it attains its finest growth in Bucks. It grows well in Ireland, and thrives in all the central and southern parts of Scotland, especially near the sea-coast; it is therefore useful for shelter, but can only be expected to do well in a sheltered situation. As an ornamental tree it may grow to about 300 years, and as regards longevity ranks far behind oak, chestnut, or elm. Though shedding its leaves like other deciduous trees, yet if kept closely clipped as a hedge it retains the dead foliage throughout the winter. As a hedge it can easily be grown to a height of 10 to 12 feet, the highest and most celebrated beech-hedge in Britain being that at Meikleour, Perthshire. But it is as a forest tree that the beech is most useful. It is a shade-enduring tree, which can form close canopy in woods; and it is thus well suited for forming on suitable land the bulk of any timber-crop in which light-demanding trees, like oak, ash, larch, &c., are to be grown. And such a mixture has the further advantage that when the beech-leaves, which are comparatively rich in potash, fall and decompose, they form the very best kind of *humus* or vegetable mould, and help to enrich the soil. Hence a mixture of beech is of special value in oak-woods, such as the extensive woodlands in the Forest of Dean, Gloucestershire. The wood produced by the beech, although it was once classed as next to oak and ash in point of actual use in Britain, is now of no high general value as timber. It is brittle, short-grained, and not well suited to purposes demanding strength and durability, though durable when used in dry situations or entirely under water (mill and sluice work). Its chief use in England is for chair-making, an industry carried on largely for centuries back in and around High Wycombe (Bucks), but now mainly dependent for its raw material on imports of beech from the Continent. Other uses of beech-wood in Britain are for butchers' blocks, boot-trees and lasts, carpenters' planes, wooden bowls, and such articles. On the Continent it is of great importance as furnishing the best kind of domestic fuel and of charcoal, but is also largely used for railway-sleepers (after impregnation with creosote), wood-pavement, bent-wood furniture (Austria), parquet-flooring, carts, and agricultural implements. Beech-mast was formerly highly prized for the pannage of swine in England, and constant references to this are to be found in

Domesday-book. In central Europe the nuts are pressed to yield an oil, considered equal to olive-oil for cooking.

The customary Bucks way of regenerating the beech-woods is to make partial clearances every fifteen to twenty or thirty years, and to await a spontaneous crop of seedlings on a good mast recurring every five to seven years; and this is left to grow up till another partial fall of mature timber takes place. On the Continent a more systematic treatment is followed, the wood being divided into five or six blocks, in each of which in turn felling is continued for twenty years.

The chief varieties found in pleasure-grounds are the COPPER or PURPLE BEECH (*F. s. atropurpurea*), with dark-red or purplish-brown foliage, and the CUT-LEAF BEECH (*F. s. laciniata*), which are propagated by cuttings. The colour of the Copper Beech appears also in some degree in the narrower and longer leaves of the RED BEECH of North America (*F. ferruginea*), which forms extensive forests.—Two species of beech are found on the mountains of Java; four are natives of the more elevated parts of the south of New Zealand; several belong to the south of South America. The genus is, in fact, more characteristic of the colder latitudes of the southern than of the northern hemisphere. *F. Cunninghamii* is the 'myrtle-tree' of the mountains of Tasmania—a large tree with small, evergreen, leathery, serrate leaves. The evergreen beech of Tierra del Fuego (*F. betuloides*) forms forests whose dark-green foliage contrasts strikingly in winter with the dazzling snow. *F. antarctica* ascends higher on the mountains about the Strait of Magellan. *F. procera* grows and attains a majestic size in the Andes of Chile. In Australia the name is applied to trees of many other genera. The Black Beech is a *Cryptocarya*, the Queensland Beech a *Gmelina*, the Native Beech a *Callicoma*.

Beech-drops. See CANCER ROOT.

Beecher, one of the most remarkable families that America has produced since the settlement of the continent. Its founder was one of the original colonists who settled in 1638 at New Haven, Connecticut; and there LYMAN BEECHER, an eminent divine, was born on the 12th October 1775. He graduated at Yale College in 1797, and became a Presbyterian minister. He preached at East Hampton, on Long Island, from 1798 till 1810; at Litchfield, Connecticut, from 1810 till 1826; and in the latter year was called to a pulpit in Boston, with the avowed purpose of counteracting the growth of Unitarianism, which, under the influence of Channing and others, was then rapidly advancing. Of an energetic and positive character, Beecher was always among the foremost to combat what he considered the evils of his time. As early as 1806 he attacked the practice of duelling, in a sermon suggested by the killing of Alexander Hamilton by Aaron Burr, and he laboured earnestly in the cause of temperance in the early days of that reform. In 1832 he became president of Lane Theological Seminary, near Cincinnati, Ohio, a position which he held for twenty years. Though a professed Calvinist, he was arraigned for heresy by the extremists of his faith, but was acquitted by the presbytery, and thenceforth was a recognised new school leader in the controversy which rent the Presbyterian Church into old school and new school factions. He resigned the presidency of the seminary in 1852, and died January 10, 1863. In 1864 was published his autobiography and correspondence, edited by his son. Mr Beecher was the father of thirteen children—seven sons (all of whom became clergymen) and six daughters.

CATHERINE ESTHER, the eldest child of the family, was born at East Hampton, on Long Island, September 6, 1800. In early life she became engaged to a Professor Fisher, of Yale College, who was lost by shipwreck, and she never married. From 1822 to 1832 she was principal of a seminary in Hartford, Connecticut, and subsequently devoted her energies and her pen to the advancement of female education. She wrote numerous volumes, principally relative to the needs and duties of women. She died May 12, 1878.

HARRIET ELIZABETH (Mrs Harriet Beecher Stowe), author of *Uncle Tom's Cabin*, was born in Litchfield, Connecticut, June 14, 1811. In her childhood she received careful training both at home and at the academy of her native village, and she early developed a fondness for writing—often upon the most abstruse subjects—that amounted almost to a passion. It is recorded that when twelve years of age, at an annual exhibition of the academy, she surprised her friends by the production of an essay on the negative side of the question, 'Can the Immortality of the Soul be proved by the Light of Nature?' On leaving the academy she joined her sister Catherine at her school in Hartford—first as pupil and afterwards as teacher. There she remained until the appointment of their father to the presidency of Lane Theological Seminary, when the two daughters established a school at Cincinnati, Ohio, adjoining the slave-state of Kentucky. Here Harriet saw much of the practical workings of the institution of slavery, and became acquainted with many of those scenes and incidents which she afterwards so graphically described in her anti-slavery writings.

In 1836 she married the Rev. C. E. Stowe, a theological professor in Lane Seminary, with whom she subsequently removed to Brunswick, Maine, and in 1849 she issued her first work, *The Mayflower, or Sketches of the Descendants of the Pilgrims*. In 1851 she engaged to contribute a story to *The National Era*, a Washington anti-slavery paper. This was *Uncle Tom's Cabin*, by far the most notable novel till then published in America; over 150,000 copies were at once sold in the United States, and in Britain over 1,000,000 copies were disposed of in a twelvemonth. Despite the pope's prohibition, it was eagerly read in all Continental countries. It appealed to all abolitionists and haters of slavery, as also to multitudes of strict Puritans who suspected all novels, and disliked mere tales of love and romance. The author's ardent sincerity speaks from every page—her genuine loathing of cruelty, her indignation at oppression, and her scorn of the sophistry by which slavery was defended. *Uncle Tom* and her next story, *Dred, a Tale of the Dismal Swamp*, as pamphlets with a tendency, accomplished vastly more than Dickens. Lincoln not unjustly described their author as 'the little woman who made the war.' Modern readers are more apt to note the diffuseness, exaggeration, and unction of these famous books, and accordingly to find them not a little tiresome. Her later works expose more fully her defects as an artist—*The Minister's Wooing* (1859); *The Pearl of Orr's Island* (1862); *Agnes of Sorrento* (1862); *Oldtown Folks* (1869); *My Wife and I* (1871); *Paganic People* (1878), &c. As for her charge against Byron's morals (supported later by members of his family) in *Lady Byron Vindicated* (1870), it may be said that she was mainly moved by her profound conviction that the story she told was true, and that it justified a misjudged wife. She outlived her fame, and is remembered rather as a great missionary than as a great writer. Her last years were darkened by family troubles, heavy financial losses through the war, and the clouding

of her mental powers. She died at Hartford, Conn., 1st July 1896. See the *Life*, compiled from her letters and journals, by her son in 1890, and another by her son and grandson in 1911.

HENRY WARD BEECHER, born at Litchfield, Conn., 24th June 1813, graduated at Amherst College, Massachusetts, and as pastor at Indianapolis was identified with the abolition movement, in his sermons depicting the horrors of slavery in the United States. In 1847, on the organisation of Plymouth (Congregational) Church, in Brooklyn, New York, he accepted the pastorate, and practically ignoring formal creeds, announced his determination to preach the gospel of Christ, and to do battle in the causes of temperance and anti-slavery. An immense congregation was attracted by his ministrations, and during his subsequent career of forty years (less a few months) he laboured in this chosen field with an almost unparalleled earnestness. He aided in establishing *The Independent*, a politico-religious journal, to which he was for nearly twenty years a prominent contributor. He favoured the free-soil party in the presidential campaign of 1852, and denounced the repeal of the Missouri Compromise (1854); and in the contention which followed between the pro-slavery and anti-slavery factions in the settlement of the territory of Kansas, he openly counselled the meeting of force with force if necessary in the protection of the Free State settlers in their rights. He was an ardent supporter of the republican candidates in the presidential contests of 1856 and 1860, and on the breaking out of the civil war, his church raised and equipped a regiment of volunteer soldiers for service in the field. Some rest to his overtaxed powers becoming necessary, he visited Europe in 1863, and on his return to England from the Continent, he delivered addresses on the condition of his country to crowded meetings, often of unsympathetic auditors; and it is not unreasonably claimed by his friends that he did much at this time towards convincing the British public that his government would ultimately triumph. On the close of the war in 1865, Mr Beecher became an earnest advocate of reconciliation between the two sections on the broadest ground of charity and goodwill. He even alienated, by his liberal course, many of his former political friends, among others the editor of *The Independent*; and his connection with that journal ceased. Later (1870) he assumed the editorship of *The Christian Union*, the circulation of which increased in one year from 3000 copies weekly to over 30,000. Of the charge of adultery with a member of his church, preferred against him in 1875, it is enough to say that one trial resulted in the disagreement of the jury; whilst another before an ecclesiastical council was decided in Beecher's favour. The decade of active usefulness which followed served to restore to the great preacher a large measure of public confidence and esteem. He visited Great Britain in the summer of 1886, delivering numerous addresses, and on his return resumed his pastoral duties, in the active discharge of which he died of apoplexy, March 8, 1887.

Of his published writings, the principal are *Star Papers* (1855), first published in *The Independent*; *New Star Papers* (1858), republished under the title of *Summer in the Soul*; *Thoughts as they Occur*, contributed to the *New York Ledger*, and republished, under the title of *Eyes and Ears* (1864); *Lectures to Young Men* (1844; revised ed. 1850); *Aids to Prayer* (1864); *Norwood, or Village Life in New England* (1867); *Lecture-room Talks* (1870); *Yale Lectures on Preaching* (3 vols. 1872-74); *The Life of Jesus the Christ* (2 volumes, 1871-91), &c., besides many separate sermons and addresses. See his *Life*, by Joseph Howard, jun.

(1887), that by Scoville (1888), and his *Autobiographical Reminiscences* (ed. by Ellinwood, 1898).

Beechey, SIR WILLIAM, R.A., born at Burford, Oxfordshire, in 1753, entered the Royal Academy as a student in 1772, and devoted himself chiefly to portrait-painting. In 1793 he was elected an associate of the Royal Academy; and in 1798 he received the honour of knighthood, and was made a Royal Academician, for his picture of the Cavalry Review in Hyde Park by George III., which is reckoned his best work. Beechey now received the patronage of the royal family and court. Among his portraits are those of Lord Nelson, Sir William Hamilton, Lord St Vincent, Lord Cornwallis, John Kemble, and Mrs Siddons. Beechey was not a painter of the first rank, but his portraits are generally characterised by easy attitude and naturalness of expression. He died at Hampstead, 28th January 1839.—His son, FREDERICK WILLIAM, born in London in 1796, entered the navy at the age of ten. In 1818 he took part under Franklin in a scientific voyage of polar discovery; and the services he rendered with his pencil during this voyage gained a grant of £200 from parliament. In 1819 he was engaged in another arctic expedition under Parry; and in 1821 rendered further important services to science by his exploration of part of the north coast of Africa, of which the results were published in 1828. In 1825 he received a commission to proceed by the Pacific Ocean and Behring Strait to the Polar Sea, in order to communicate, if possible, with Franklin, who was to make the journey overland from North America. The explorers did not meet, although at one time they were within 150 miles of each other. Beechey returned in 1828. He died Rear-admiral of the Blue, 29th November 1856. See his *Voyage of Discovery towards the North Pole* (1843).

Beechworth, chief town of the Murray district in Victoria, and of a considerable goldfield, 170 miles N.E. of Melbourne; pop. 3000.

Bee-eater (*Meropidae*), a family of birds nearly allied to kingfishers. Numerous forms occur, widely distributed in Africa, India, Moluccas, and Australia, and are well known for their bee-eating propensities and bright plumage. The Common Bee-eater (*Merops apiaster*) very rarely occurs in Britain,



Common Bee-eater (*Merops apiaster*).

but is an exceedingly abundant summer visitor in Southern Europe. Even Aristotle speaks of its ravages among the bees, which the bird seizes on its swallow-like flight, or by watching beside the hives. They excavate long holes which honeycomb the banks of rivers like the Don and Volga.

These nests are sometimes 10 feet deep, and the wearing away of the rather long bill testifies to the amount of labour which they expend to secure the safety of the young. These are often seen sunning themselves at the openings of the holes, tumbling back when alarmed by the approach of reptilian or other enemies. When the flowers wither and the bees cease to work, the birds migrate southwards, and breed again in Africa, where Livingstone has described their excavations on the banks of the Leeba. Their bright, predominantly green plumage is often used to decorate ladies' hats, and they have further some practical importance on account of their destructiveness to bees, which is compensated to some extent, however, by their ravages among wasps and other insects. The Hottentots watch their flight in order to find the bee-nests.

Beef. See CATTLE, FOOD.

Beef-eater (*Buphaga*), a small genus of African perching birds, nearly related to the starlings. The name Ox-pecker is more accurately descriptive of their habit of feeding on the larvæ of gadflies and the like, which they find on the backs of cattle, camels, rhinoceroses, and other large animals. Livingstone notes how the sharp eyesight of the South African Buffalo Birds (*B. africana*) make them useful sentinels to the cattle herds, and the same has been observed in regard to the rhinoceros. Their habit of devouring the insect pests, which they generally do without irritation to the infested animals, is evidently convenient and pleasant both for themselves and the cattle.

Beef-eater, a term now applied jocularly to certain functionaries belonging to the Yeomen of the Guard (q.v.), who, ever since the time of Henry VII., at whose coronation they made their first appearance, 30th October 1485, have formed part of the train of royalty, attending the sovereign at royal banquets and other state occasions. The Tower Warders are a distinct corps from the Yeomen of the Guard, and had their origin in the reign of Edward VI., when fifteen of the Warders were sworn in as Extraordinary Yeomen of the Chamber. They received liveries like the Yeoman of the Guard in ordinary, but are distinguished from them by the absence of the cross-belt. The costume has varied somewhat during the four centuries; a slight alteration was made in 1858; and in 1885 a cloth hat was given to be worn with the undress uniform of the Tower Warders. Their costume has had much to do with their attractiveness to sight-seers. The word has of late been usually regarded as a corruption of *buffetier* (Fr.), or *beaufetier*, one who attends the *buffet* or sideboard. It would thus be an instance of what Latham calls 'foreign words simulating a vernacular origin;' like *sparrow-grass* for *asparagus*, *ancient for ensign*. But Skeat holds that *beef-eater* is simply *eater of beef*, a servant or dependant, and quotes *eaturs* (from Ben Jonson) and *powder-beef lubbers* used in a similar sense. See T. Preston's *Yeomen of the Guard* (2d ed. 1887).

Beef-tea is a light and pleasant article of diet. It is best made as follows: A pound of lean beef is cut into small pieces and placed in a closed jar with a pint of cold water; after an hour the jar is allowed to stand for another hour in a pan of gently boiling water; the contents are then strained through a coarse sieve. Beef-essence may be made by placing the meat in a jar with two tablespoonfuls of water and simmering it as above for two or three hours, when three or four tablespoonfuls of thick fluid can be pressed out. Salt is then added according to taste. Either process removes from the meat almost all its salts and extractive matters, with a proportion of its albumen and gelatine.

Beef-tea is popularly supposed to contain all the nourishment of the meat from which it is made. This is a great mistake; for though the substances which give the beef its flavour are extracted, far the larger part of the nutritious albumen and gelatine remain in the tasteless and hardly digestible residue: more complex processes are required to obtain highly nutritious extracts from meat. It is, however, of great value in the treatment of invalids, for the nutritious elements which it does contain are, so far as they go, in a digestible form; it is, moreover, a pleasant stimulant, a relish which may enable a sick person with poor appetite to eat other food with enjoyment, and a suitable vehicle for the administration of more nutritious material, for example, some of the easily absorbed 'peptones' or 'infants' foods' in the market. It must always be borne in mind that beef-tea alone has not a high value as a food, and that the increased sense of strength and well-being often following its administration is due to a stimulating more than to a nourishing effect, and is therefore transient and sometimes harmful. Moreover, in some diseases, particularly gout and kidney-disease, it is usually injurious. Mutton, treated in a similar manner, yields a broth or tea which is not so easily digested, and is hurtful to persons of weak stomach, especially if the fat be not skimmed off from the liquid. A knuckle of veal affords a similar broth or tea; but it is not so light as beef-tea, and, moreover, gelatinises on cooling. A broth or tea prepared from a young chicken is, of all decoctions of animal matter, the most readily digested, and is specially suitable for invalids, where great irritability of the stomach exists.

Beef-wood. See CASUARINA.

Beehive Houses. The beehive plan of construction is a primitive method of throwing a roof of dry-stone masonry over a chamber of the same. In building with hewn stones and mortar, a stone-roofed chamber would be vaulted on the principle of the arch; but in primitive building with undressed stones and without mortar, the method was adopted of setting inward each successive course of the upper part of the side walls, until the space to be

in the chambered cairns or barrows of Britain and Ireland; and as these have been shown by their contents to belong to the stone age, it is therefore the earliest method of constructing a roof of which we have extant evidence in the British Isles. It is also the usual style of the basement chambers of the Brochs, or so-called 'Pictish towers' of Scotland, which belong to the iron age. In the early Christian period, many of the small churches and oratories of the Celtic Church in Scotland and Ireland were still constructed in the same primitive manner; and the dwellings of the monks in early Celtic monasteries have been termed 'beehive houses,' from their being almost invariably built of dry stone and roofed in this manner. In some districts of Ireland, as in Kerry, the remains of beehive houses, called by the country-people *cloghans*, are still abundant. They are not connected with ecclesiastical sites, but seem to have been the common dwellings of the inhabitants at some time probably not extremely remote, but now unknown. O'Flaherty, mentioning the *cloghans* of West Connaught in 1684, describes them as buildings of stone, brought to a roof without any manner of mortar to cement them, some of which would hold forty men on their floor, and which were so ancient that nobody knew how long ago any of them were made. In the Western Isles of Scotland there are many remains of beehive houses of quite recent date. Captain Thomas saw forty or fifty in a limited area of the island of Lewis in 1857; and Sir A. Mitchell recorded in 1880 that not more than from twenty to thirty were then inhabited. These, however, were not the permanent dwellings of the people, but the huts of their summer shielings, erected usually on grassy spots in the glens to which they proceed with their cattle, and remain making butter and cheese in July and August, 'during which time,' says Captain Thomas, 'they dwell in these circular stone-roofed houses called *bothan*, or in timber-roofed ones called *airidhena*.' The *bothan* are seldom larger than 10 feet in diameter; a row of stones is placed across the interior for a seat, on one side of which is the fire, and on the other the sleeping-place. Many of the older ones, however, have several chambers, each with its beehive roof. Huts of beehive shape, but of light materials, are used by various savage peoples.

Beehive Tombs, domed tombs of the Mycenaean culture, such as the 'Treasury of Atreus' and others at Mycenae (q.v.) itself, and those at Orchomenos and Vaphio. Sometimes they have been formed by excavation.

Bee-kite. See HONEY BUZZARD.

Beelzebub ('god of flies'), the form of Baal worshipped by the Philistines at Ekron. The Greeks also had Zeus 'Apomyios' or 'Myiagros' ('dispenser of flies'), doubtless a god of flocks and herds. As the heathen deities were all regarded as demons by the Jews, the name Beelzebub became, in course of time, commonly applied to the chief of evil spirits, and in this sense it is employed in the Gospels. The New Testament reading *Beelzebub* is variously explained; see BAAL.

Beer (Fr. *bière*, Ger. *bier*) is a beverage prepared from grain (usually barley) which is malted or otherwise prepared, ground, and infused with hot water; the extract is drawn off, boiled with hops, cooled, and fermented. It is prepared with varying quantities and qualities of the materials, and the resultant drink differs so greatly as to be known by the different names of strong ale, pale ale, bitter ale, mild ale, small beer, stout, porter, lager beer, &c. Beverages resembling beer have been brewed from the most ancient times. Herodotus states that the Egyptians prepared such a drink, and in the 1st century Tacitus states that it



The larger Beehive Cell in Skellig Mhichel.
(From a Photograph by Lord Dunraven.)

spanned was so reduced that it could be covered in by a single stone, or by several stones laid lintel-wise, side by side. This method of constructing a stone roof is found in many varieties of prehistoric structures. It is the usual style of roofing the chambers

was the common drink in Germany. Pliny states that it was prepared in Gaul under the name *cerevisia*, and in Spain as *ceria* (*ceres*). We do not know when beer was first introduced into Britain, but it was in common use in the reign of Edward the Confessor, and the frequent mention of it in the national records shows that it has continued so up to the present day. Ale and beer seem originally to have been synonymous; both words (A.S. *alu*, *calu*; *béor*) were in use before the Norman Conquest. Beer occurs in Old English but rarely save in poetry, and did not become common till the 16th century, when, hops having been introduced into England, the word meant hopped malt liquor as distinguished from ale (unhopped). The brewer for sale existed in 1492, but until the end of the 18th century domestic brewing was as common as domestic baking. To-day the beer of the nation is almost entirely the product of a few large breweries, where the most suitable materials are employed under careful scientific direction, utilising the best apparatus, in order to turn out the brilliant, sparkling, and pleasant-flavoured article a critical taste demands.

The most important materials are water, malt, and hops. In some beers a portion of the malt is replaced by sugar, or raw or prepared grain, or a combination of these; and in a few cases a portion of the hops is replaced by other flavouring material. Roasted malt gives colour and flavour to stout and porter, and isinglass is used to assist in fining beer.

Water used in brewing is usually obtained from wells or springs; though rain, river, or lake water may be employed if free from sewage or other contamination. As a general rule water suitable for drinking is also suitable for brewing, but particular kinds of potable waters are especially adapted to the preparation of the many varieties of beer. The soft Dublin water has materially contributed to the fame of Dublin stout, and the hard gypseous water of Burton-on-Trent to that of the well-known pale, strong, and export ales of that town. It is quite usual for brewers to treat the natural water with salts in order to imitate natural waters of proved brewing suitability.

Malt is prepared from Barley (q.v.)—very rarely other grain—and only in the cooler portion of the year, as the process cannot be successfully controlled in warm weather. The most important qualities which the maltster requires of the barley are that it should be ripe, and that he should receive it uninjured by the various processes and conditions to which it has been exposed. Experience has also shown that barley from special districts and of special varieties has advantages over other barleys for the preparation of malt suitable for the different kinds of beer. Maltings, the buildings in which barley is converted into malt, consist essentially of two portions: the growing-floors on which germination takes place, and the kilns on which the germinated barley is dried. A steeping-cistern is placed on the growing-floor, and there are usually malt and barley stores, and machinery for cleaning barley and malt and moving the grain. The barley, on arrival at the maltings, is usually screened to remove broken corns, other grain and dirt, and often dried on a kiln; this increases the regularity of germination. The barley is then steeped in cold water in brick or iron cisterns for two or three days, the water being changed several times. At the termination of the steep, the grain, which is now quite soft, is thrown out of the cistern in a heap, called the couch. Germination at once begins, and is soon apparent by the chitting of the corns, a rise of temperature, and the emission of carbonic acid gas. The couch is now broken down, and the grain spread on the growing-floor of the malt-house. The floor is

usually of cement or tiles. The object of the maltster is now so to control the germination of the grain that at the end of about ten days he will have the grain so mellowed by the germination changes that its Starch (q.v.) will be readily soluble in the mashing process, without at the same time suffering an undue loss by respiration or becoming damaged by the growth of mould or other organism. This he effects as circumstances indicate: by opening the windows and spreading the grain over a greater area of floor, and thus reducing its temperature; by allowing the heat of germination to warm it by the converse procedure, or by moistening it, or allowing it to dry. The particular treatment required can only be decided after much practical experience. The germination having thus been guided to the right extent, the grain will be found to have acquired several bushy rootlets, and the acrospire or shoot to have grown up under the palæ or outer skins about two-thirds to three-quarters the length of the grain. It is now ready to be dried on the kiln. The drying-floor is usually composed of perforated tiles, and under it are placed one or more fires of coke or anthracite. Over the drying-floor the roof is furnished with cowls or louvres, which can be opened or shut as required. In the United Kingdom it is not usual to have more than one drying-floor in a kiln, but sometimes a second one is placed above. It is also usual in this country to dry the malt by passing the products of combustion of the coke or coal directly through the grain; but, again, in some kilns the malt is dried by hot air which has been heated by passing in pipes through the furnaces. The germinated grain, being loaded upon the kiln-floor, is slowly dried by the passage through it of large quantities of hot air for two or three days. Towards the end of the time the volume of air passing through is decreased, and the temperature allowed to rise to about 200° F. This latter stage of the drying is called curing, and during it the grain acquires the desired biscuity flavour. The dry malt is then thrown off the kiln and the rootlets (malt culms) removed. When cold the malt is stored in bins until required.

Hops (*Humulus lupulus*) were known to the ancient Greeks, and are described by Pliny as *lupulus*, an appetiser and salad. Their use in brewing beer appears to date from at least the 8th century, as in 768 a hop-garden is mentioned as given to the monastery of St Denis, and it is difficult to see for what other purpose hops would be extensively grown. In 1364 an enactment was made in Germany concerning hopped beer, so that the use of hops appears to have been common at that time. Hops, however, do not appear to have been used by English brewers before 1492; and although both Henry VII. and Henry VIII. forbade their use, Edward VI. allowed them, and they have since continued in use. The hop used in brewing is the fruit, or strobile, of the plant. This somewhat resembles a fir-cone, and consists of a stem or strig, with a number of short branches arranged alternately along its opposite sides. On each of these branches grow leaf-like structures called bracteoles, which carry at their base the seeds. In addition to these are similar bracts which do not bear seeds. On both these kinds of bracts are the lupulin glands containing the oils and resins on which depend the flavouring and preservative power of the hop. There are many varieties of hop, distinguished by the shape of the cone, the shape of the bracts and strig, &c. The cones are picked when ripe, and dried, usually on a kiln over an open fire, and often bleached with the fumes of burnt sulphur. The dried hops are compressed into canvas bags, and stored in a cool and

dry place until required. Hops give to the beer that pleasant, bitter, and aromatic flavour which distinguishes it from other alcoholic beverages. During the boiling process they assist in the precipitation of insoluble matter, and in the clarification of the brew. The resin of the hop constitutes the chief preservative of the beer. The bitter of the hop has the important property of being transient, the bitter quickly leaving the palate; most vegetable bitters are persistent. Hops possess distinctly narcotic properties.

The world's hop-crop varies much from year to year; the average is about $1\frac{3}{4}$ million cwt. The following are the figures for 1911:

	Cwt.	Acres.
Bavaria	120,000	43,437
Rest of Germany	107,000	23,272
Austria	184,000	52,310
England	323,000	33,050
United States of America	390,000	46,250
Other countries	145,000	36,395
	1,274,000	234,714

The following is the official estimate of the English crop of 1914:

	Cwt.	Acres.
Kent	313,704	22,626
Hants, Surrey, and Sussex	74,430	5,201
Hereford, Worcester, Gloucester, and Salop	114,124	8,834
	507,258	36,661

The average yield per acre, 13·8 cwt., in England—hops are not grown in Scotland or Ireland—in 1914 exceeds the average of the preceding ten years by 4 cwt.; the consumption of hops in the United Kingdom in 1914 was 559,424 cwt.; the balance required had to be imported. Exigencies of the war caused a reduction of the English hop acreage, and the crop of 1918 was only 130,272 cwt., whereas double this amount was used.

Sugar used in brewing is usually glucose, cane sugar, or invert sugar (see article SUGAR).

Raw grain is usually either maize, rice, or barley; which are also used after previous preparation to render their starch soluble in the mash-tun.

Breweries consist essentially of two parts, the brew-house, in which the preparation of the extract of the malt (wort) takes place, and the tun-house, in which the fermentation of the wort takes place. There must of course also be subsidiary buildings for the cleansing of the casks, the storing of the materials and the finished article, &c. The process of brewing commences with the grinding or crushing of the malt, usually between two iron rollers. The crushed malt is stored in hoppers placed over the mash-tuns. The mash-tuns are circular vessels of iron or wood fitted with (1) draw-off pipes in the bottom, (2) a false bottom of perforated plates to prevent the insoluble portion of the malt from getting into these pipes, (3) a sprinkler or sparger for distributing hot water on the surface of the goods, and (4) machinery for thoroughly mixing the malt and water. The ground malt and hot water are either mixed together as they fall into the tun, or water of the requisite temperature and amount is first introduced, and the malt allowed to fall into this and well mixed by revolving rakes. The action of hot water on the malt causes a number of chemical changes, the most important of which is the conversion of the starch, by the action of diastase, into maltose and dextrin. Other ferments are also present and act, amongst which is a proteolytic one. These changes are materially affected by the temperature, and experience has shown that 150° F. or thereabouts is the most suitable for the preparation of a wort for brewing beer. The mixture (the mash) is allowed to stand for a couple of hours, and then the taps under the mash-tun are opened and the extract run off into the coppers. The residue remaining in the

tun is then extracted by sprinkling on the surface hot water until all the soluble matter is washed out from the draff, which is called 'brewers' grains,' and is used for cattle-feeding. This method of preparing the wort—the one commonly employed in the United Kingdom—is known as the 'infusion method.' A modification known as the 'decoction method' is usually employed in the preparation of lager beer. In this about one-third of the mash is pumped into a special boiler called the mash-copper, and in this it is boiled for a short time, and then returned to and mixed with the remainder of the mash in the mash-tun; again a third of the mash is pumped into the mash-copper and boiled, and again returned to the mash-tun and this process again repeated. The process of extraction then proceeds as in the infusion method. The wort, however prepared, is next boiled with hops in the wort-coppers. These are, as their name indicates, copper vessels heated either by furnaces or by steam. The average weight of hops per barrel used by British brewers is 1·85 lb. The two other chief beer-producing countries, Germany and the United States of America, use only about half this weight of hops per barrel of beer brewed. A greater weight of hops per barrel is used in the preparation of bitter ales than of mild ales of the same strength, and a still greater weight of hops in the preparation of ales that are to be kept for some time as strong ales and export ales. After some hours' boiling, the wort is run into the hop-back, which is a vessel containing a false bottom for straining the hops from the wort. The boiling has caused (1) a certain amount of concentration, (2) the precipitation of some of the constituents of the wort, and (3) the acquisition of the bitter flavour of the hop. The clear wort runs from the hop-back on to the cooler. This is a large, shallow vessel on which a certain amount of cooling of the wort takes place, and also the precipitation of some of the wort constituents; from the cooler the wort passes through the refrigerator, in which it meets a current of cold water contained in thin walled tubing, and by which it is cooled to a temperature suitable for the commencement of fermentation. Before the invention of refrigerators the whole of the cooling had to take place on the cooler, but ever since the introduction of these appliances the tendency has been to diminish both the size of the cooler and the time the worts lie on it. At present most of the cooling is done on the refrigerator. Some brewers have even ceased to use coolers, but this is not yet the common practice. The cooled wort is run from the refrigerators into suitable vessels, usually of wood, either round or rectangular, and the yeast added to start the fermentation. The worts for the preparation of British pre-war beers average in specific gravity 1053, and contain in 100 parts about 13 parts of solid matter. In a wort prepared from malt and hops alone, about two-thirds of this would be fermentable sugars and one-third of it unfermentable carbohydrates, nitrogenous matter, and mineral matter. Fermentation at once begins, and outward signs of it soon appear in the shape of a creamy head (caused by the evolution of carbon dioxide) and a rise of temperature (due to the heat evolved by the chemical reaction). The Fermentation (q.v.) consists mainly in the decomposition of the sugars of the wort into approximately equal quantities of alcohol and carbon dioxide. Owing to the facts that (a) a solution of sugar in water is heavier than water, (b) a solution of alcohol in water is lighter than water, and (c) that most of the carbon dioxide produced escapes as gas, there is a continuous decrease in the specific gravity of the wort as the fermentation proceeds; this affords the brewer a convenient means of watching the fer-

mentation. The specific gravity of the fermenting wort is called its attenuation.

So far the methods of all brewers (except the modifications of the mashing process above described) are very similar; but the fermentation is carried out very differently by brewers of the various varieties of beer, and so it is necessary to describe each process separately. The brewer of ale and stout uses a top or high-fermentation yeast—i.e. one that rises to the top of the fermenting liquid towards the end of the fermentation. The worts are pitched—that is, the yeast is added—at about a temperature of 60° F. By suitable cooling means the temperature is controlled, and usually not allowed to rise above 70° F. Towards the end of the fermentation the yeast rises to the surface, and must be promptly removed or the beer will acquire a coarse, yeasty flavour. This removal is effected in various ways; the simplest, and probably oldest, is to fill casks with the fermenting wort, and allow the yeast to work out through the bung-hole, the wastage as it arises being made good by fresh beer. The Burton Union system is a direct development of this. In this system a row of casks each holding about 150 gallons, supported on their sides and bung-hole uppermost, are connected together by a pipe. In the bung-hole of each fits a swan-neck-shaped metal pipe which overhangs a trough (the yeast-trough) placed over the casks. There is usually a row of casks on each side of the yeast-trough. At the end of this 'Union set,' as it is termed, is a smaller cross trough (the feeder) at a level intermediate between that of the yeast-trough and the casks, and connected with the yeast-trough on the one side and on the other with the pipe uniting the row of casks. The casks and a part of the yeast-trough and feeder are filled with wort which has commenced its fermentation in another vessel; the gas produced by the fermentation forces a part of the liquid as a froth up the swan necks into the yeast-trough. The beer separating from this passes back through the feeder into the casks; this circulation continues as long as the fermentation continues. Shortly before the end of the fermentation the yeast rises, and, accompanied by some beer, passes through the swan necks. The yeast collects in the yeast-trough, and the beer separating passes back through the feeder into the casks. At the end of the fermentation the casks are full of beer and the yeast is all in the yeast-trough. The Skimming system is another method for separating the yeast from the beer. In its simplest form, the yeast is simply skimmed off as it rises to the surface; it is usual, however, to save this labour by having fixed in the fermenting vessel pipes with openings adjustable to the correct level, so that as the yeast rises it flows through these to a vessel below. These two methods for removing the yeast from the beer result in an article which varies somewhat, and local brewers make use of modifications to produce a beer suited to the local taste. After the separation of the yeast (this is never quite complete) the beer is racked into the carriage-casks, a handful of hops being usually added, and the bung inserted and hammered tight. The beer-casks in general use in the United Kingdom are butt=108 gallons, hogshead=54 gallons, barrel=36 gallons, kilderkin=18 gallons, firkin=9 gallons, and pin=4½ gallons. They are usually made of Baltic oak, with wrought-iron hoops. Stout is often placed in large vats for some time before it is racked into the carriage-casks. As the fermentation is purposely never quite completed in the brewery, it continues slowly in the cask, and in a week or so sufficient carbonic acid gas has been produced to make the beer fresh or 'in condition'; it is then ready for consumption, a little isinglass finings being usually added to facili-

tate brightening. Some beers, such as export and strong ales, require a much longer period of time to mature, extending in some cases to years.

Beer for bottling is allowed to fall quite bright in cask and then bottled; after a month or so in bottle it will develop the well-known flavour and condition of bottled beer, which is caused by a fermentation in bottle, a sediment being at the same time thrown out. Although, from the nature of the case, it is impossible to mature beer in bottle without the production of some sediment, yet it has been found possible to mature beer in cask or large tanks, and then transfer it to bottle without loss of condition; this product, although wanting the piquancy of beer matured in bottle, has yet, from its obvious advantages, achieved a certain vogue. Such a bottled beer is prepared by taking a newly racked beer and highly charging it with carbonic acid gas, either by pumping in this gas or by the fermentation of sugar added or naturally existing in the beer. The beer, when charged with gas under considerable pressure, is cooled to near the freezing-point, and at once, or after some days at this temperature, forced through a filter into the bottles. The bottles are at once tightly closed to prevent loss of gas. Such beer will remain brilliant for some time, and at ordinary temperatures shows a strong effervescence.

Lager beer appears to have been first made in Weihenstephan, a Bavarian abbey, towards the end of the 15th century. It was not, however, until the end of the 18th century that lager beer began to occupy a predominating position in the German beer trade. The general popularity of the beers of Bavaria and Bohemia spread through Germany and Austria, until now only a few local types of high-fermentation beer are brewed in these countries. In the United States of America, where brewers were largely of German origin, the methods were chiefly German. At the present time in Germany only malt, hops, and water are allowed to be used for brewing lager beer. The brewer of lager beer employs a yeast which falls to the bottom towards the end of the fermentation; hence the term bottom or low fermentation. The worts are pitched at about 40° F. The main fermentation takes about ten days, the temperature of the fermenting liquid being prevented from rising by suitable cooling devices. At the end of the principal fermentation the beer is run from the fermenting vessels, leaving the yeast at the bottom of these, into large store casks, called lager-casks, which are kept in a cellar at about the freezing-point. Here the ale matures for some months, being kept charged with gas by a slow continuation of the fermentation, and it is ultimately racked off into small casks for immediate consumption, or bottled. If the bottled ale has to be kept, it is pasteurised by heat. The table shows the composition of various beers:

	Percentage of Extract in the Wort before Fermentation.	Percentage of Extract in the Beer.	Percentage of Alcohol in the Beer.
Pale ale	16.0	4.0	6.0
Extra stout	18.0	6.0	6.0
Strong ale	26.0	8.0	9.0
Mild ale	14.0	6.0	4.5
Light bitter ale	12.0	3.0	4.5
Lager beer	14.0	6.0	4.0
Table-beer	6.0	2.0	2.0

As much has been written on beer-drinking, often without knowledge, it is worthy of note that experiments recently carried out in Berlin show that beer is not only a food of considerable value, but that it favours the assimilation of other foods partaken with it. These scientific investigations confirm the practical observations that beer, bread, and cheese make an appetising and nutritious whole.

Maladies (Defects) of Beer.—Beer is liable to many defects which render it unsaleable. These

defects are usually due to the growth of various micro-organisms for which beer, containing as it does carbohydrates and nitrogenous and mineral matter, forms a very suitable culture medium. The boiling and consequent sterilisation of the wort and the preservative power of the hop, aided by careful guarding from infection, usually enable beer to remain free from such attacks until consumed. This period, for the cheaper kinds of draught ale, extends only over a few weeks; for bottled ales, some months; and for export and strong ales, even years. In fact, special beers have been kept over fifty years in a sound condition. The diseases of beer were first investigated by Pasteur, who described many of the most important disease organisms. This work was of far-reaching importance, as it was the beginning of the study of micro-organisms, and led, among other results, to the study of those organisms which produce disease in man. Thus does humanity owe a great and lasting debt to brewing research. This work was followed up and developed by Hansen, who devised a method for producing the yeast required for pitching from a single selected cell, thus ensuring that the pitching yeast was not only free from disease organisms, but composed of the yeast giving the best flavour, &c., to the beer. This method of preparing pitching yeast is now in general use by lager-beer brewers, but, owing to difficulties not yet overcome, is not employed to any extent by ale and stout brewers. The defect that is first evident in beer is dullness or stubbornness in brightening. In the old days of pewter mugs this was not so important as to-day, when the use of glass is widespread. This defect may be due to a disease yeast which does not settle out easily, or to a bacterial growth, or to some finely divided wort constituent. Another common defect of beer is acidity. This is caused by bacteria producing acetic or other acid from some of the constituents of the beer; sometimes these bacteria are present in such quantity as to make the beer dull. If air obtains access to the beer, through the absence of a slow alcoholic fermentation or other cause leading to the loss of carbonic acid, mould-like organisms may grow in the beer, making it acid and thick. The beer may even be bright and sparkling and yet have an unpleasant taste and odour, and this may be due to the growth of disease yeasts. The study of the microbiology of beer has been developed greatly by recent observers, and the control of the fermentative changes which take place requires the services of a competent mycologist.

The shortage of cereals due to the war of 1914-18 resulted in severe restrictions on beer-brewing in the belligerent countries. In Great Britain the amount permitted was reduced in 1918 to one-third the normal quantity of standard barrels, and the average specific gravity of the worts was not to exceed 1030°. This resulted in the production of about 18 million barrels (one-half the normal brewing). In the same year in the United States of America the amount of materials permitted was reduced by 30 per cent., and the beer was not to exceed 2½ per cent. alcohol. Ultimately the total prohibition of the sale of alcoholic drink was enacted. The Central European powers had great difficulties in obtaining any brewing materials, and the average specific gravity of the worts in 1917 was only 1006°, the pre-war average being 1048°. Only 5 per cent. of the normal quantity of malt was allowed, and other materials, such as the roots of couch-grass, carrots, and beet, were used. French brewers used chestnut meal and soya-bean meal as barley substitutes. Notwithstanding the gradual disappearance of restrictions, pre-war conditions are not likely to return soon. In Great Britain the average specific gravity of the wort is restricted to 1044°, and in Ireland to 1051°;

but the bulk is unrestricted. The Central Powers will probably recover still more slowly, and in the United States prohibition still remains in force.

Statistics.—In 1913 about 500 million bushels of malt and 2 million cwt. of hops were employed in brewing 207 million barrels of beer. The following are the amounts brewed and the consumption per head in the chief beer-producing countries:

	Millions of Gallons Brewed.	Gallons per Head Consumed.
United Kingdom	1335	26·2
Australia		
New Zealand }	440	29·4
Canada		
Russia	246	1·4
Sweden	62	11·1
Denmark	45	16·1
Germany	1485	22·8
Bavaria		61·0
Belgium	360	48·0
France	353	8·8
Switzerland	75	19·8
Austria-Hungary	544	13·6
United States of America	1685	18·3

According to the official figures for the United Kingdom for the year ending September 30, 1914, there were 2536 brewers of less than 1000 barrels per annum, altogether brewing 719,398 barrels; and 1111 brewers of over 1000 barrels per annum, altogether brewing 36,965,431 barrels. The total amount of the materials used was 52,525,634 bushels of malt; 92,385 bushels of unmalted grain; 1,566,506 cwt. of rice, rice grits, flaked rice, maize grits, flaked maize, and other similar materials; 3,279,709 cwt. of sugar; 62,655,438 lb. of hops; 19,503 lb. of hop substitutes; and from these were produced 37,684,834 bulk barrels of beer, and £14,011,900 duty was paid.

Taxation.—British beer has been taxed from early times. It was not, however, until the struggle between Charles I. and the Parliament had set in that the excise can be said to have been established. The tax then levied was a beer-duty, a greater amount being charged on 'strong' than on 'small.' A duty was laid on hops at the same time, and in 1697 upon malt. For the next 130 years these three duties remained in existence. In 1830 the beer-duty was abolished, chiefly owing to the difficulties and faulty methods of collection, and the malt-tax proportionately increased. In 1862 the duty was taken off hops. In 1880 the various taxes on beer were all merged in a beer-duty of 6s. 3d. per barrel of wort of a specific gravity of 1057 before fermentation, stronger or weaker worts paying a proportionate duty. This has been increased from time to time.

See *Practical Brewing*, by E. R. Southby; *Principles and Practice of Brewing*, by W. J. Sykes, revised by A. R. Ling; *Laboratory Text-book for Brewers*, by L. Briant and H. Harman; *Laboratory Studies for Brewing Students*, by A. J. Brown; *Practical Floor Malting*, by H. Lancaster; *Manual of Brewing*, by E. G. Hooper; *The Microscope in the Brewery*, by C. G. Matthews and F. E. Lott; *The Brewer's Almanac*, issued annually by the Brewers' Society; *The Hop*, by A. C. Chapman; *Handy Book for Brewers*, by H. E. Wright; *Fermentation Organisms*, by A. Klockner (trans. by J. H. Millar); *Micro-organisms and Fermentation*, by A. Jörgenson (trans. by S. H. Davies); *Malzbereitung und Bierfabrikation*, by J. E. Thausing; *Mikroskopische Betriebskontrolle in den Gärungsgewerben*, by P. Lindner; *Das Chemische Laboratorium des Brauers*, by W. Windisch; *Chemie und Physiologie des Bieres*, by E. Prior; *Brasserie et Malterie*, by P. Petit; *Illustriertes Brauerei Lexikon*.

Beer Acts. See LICENSING LAWS, INN.

Beer-money—one penny per day when on home-service, as a substitute for an issue of beer and spirits—was from 1800 made an addition to the daily pay of non-commissioned officers and soldiers until 1873, when, the stoppages for rations

having been abolished, the opportunity was taken to consolidate beer-money and pay proper.

Beer'sheba, now BIR-ES-SEB'A ('well of swearing,' or 'well of seven'), so called because of the covenant Abraham entered into here with Abimelech the Philistine king, which he ratified with an oath and a gift of seven ewe lambs. Beersheba was situated on the southern border of Palestine, about 52 miles SW. of Jerusalem, and formed the limit in that direction of the Israelitish dominion. In the 4th century A.D., it was the seat of a large village, with a Roman garrison; some of its churches were standing in the 14th century. A heap of ruins now marks the site of the village. Two of its wells are still almost always full of water. The shafts are of round masonry, worn with the water-drawers' ropes, and they have no parapet.

Beestings (technically *colostrum*) is the term applied to the first milk yielded after delivery. It differs not a little from ordinary milk, and generally appears as a turbid, yellowish, viscid fluid, similar to soap and water. When examined under the microscope, it is found to contain, in addition to the ordinary milk corpuscles (see MILK), peculiar conglomerations of very minute fat granules, which are hence known as *colostrum* corpuscles. The chief chemical differences between beestings and milk are, that the former is very deficient in casein and proportionately rich in albumen, and that it contains nearly three times more salts than the latter. It is probably this excess of salts that usually causes it to exert a purgative effect upon the new-born offspring, and thus to remove the Meconium (q.v.) which has accumulated in the foetal intestine.

Beeswax. See WAX.

Beeswing (so called from its appearance), a filmy crust of tartar formed in port and some other wines after long keeping. See WINE.

Beet (*Beta*), a genus of *Chenopodiaceæ* (q.v.). The species are not numerous; they are mostly biennials, with smooth, ovate, stalked root-leaves, and tall, leafy, flowering stems. They are natives of the temperate parts of the Old World. The Common Beet (*B. vulgaris*) is a native of the shores of the Mediterranean, but is now in very general cultivation both in fields and gardens, chiefly for the sake of its large succulent roots, which are used as food for man and cattle, and from which also sugar is extracted (see SUGAR). The variety known as Red Beet is the most esteemed for garden cultivation. Of this there are many sub-varieties, distinguished by the form of their roots, some being tap-rooted or carrot-like, others turnip-shaped, and by the depth of purple or crimson colour they all more or less exhibit. The darkest crimson coloured are the most highly esteemed, partly



Common Beet.

on account of their more pleasing appearance when cooked, but also because they contain a larger amount of mucilage and saccharine matter than the lighter tinted kinds. Roots of medium size are preferred to those that are larger. It forms a favourite pickle, is used in salads, and is also very agreeable as a boiled vegetable when properly dressed. It is more nutritive and whole-

some than any other cultivated 'root' except the potato. When deprived of the greater part of their juice by pressure, the roots may be used as a substitute for malt. They have also in times of scarcity been ground and mixed with flour for bread-making in continental countries. The seed is sown late in spring that the plants may not produce flowering stems the first year, which would render the root fibrous and useless.—Mangold-wurzel (q.v.), so valuable as a field-crop for food of cattle, is, in general, regarded as merely a larger and coarser variety of the common beet, in which the red colour is comparatively little exhibited.—The White Beet of our gardens (*B. cicla* of some botanists) is now also generally supposed to be a mere variety of the common beet, with little or no red in its roots or leaves, and a comparatively slender root. It is cultivated for the sake of its leaves, which are used in the same manner as spinach, and form an excellent substitute for it, especially in summer, when heat and drought deprive it of its essential succulence. The leaf-stalks and midribs of the leaves, especially of a variety in which these parts are unusually developed, are blanched and dressed for table in the same manner as sea-kale, and named *Chards*. Sea-beet (*B. maritima*) grows wild upon the shores of Britain, and differs from the common beet in its perennial root, its partly prostrate stems, and other characters. The leaves are used for food in Ireland, as are also those of *B. Bengalensis* in the East Indies.

The process of making beet-sugar will be treated at SUGAR. The development of this manufacture in France, Austria, and Germany enormously extended the cultivation of beet-root, and importation of beet-sugar seriously affected the sugar trade in Britain. The growth of the beet-sugar manufacture, fostered by bounties, was especially rapid in Germany and Austria. In France the growth was not so rapid, though manufacture and exportation were also stimulated by bounties. The abolition of sugar bounties (from 1st September 1903), agreed to by the Brussels Sugar Bounties Conference, 1902, very considerably affected the sugar trade and other trades dependent on it. Britain withdrew from the Convention in 1913. About 1883 the production of beet-sugar began to exceed that of cane, and this lead was maintained till 1910-11, when cane-sugar again took the lead with a production of 8,526,800 tons against 8,393,000 tons of beet-sugar. The area and conditions of cane-sugar countries thereafter increased the lead. In Germany nearly 11 per cent. of sugar is obtained from a given weight of beet-root. A large proportion (from $\frac{1}{3}$ to $\frac{1}{2}$) of the saccharine matter of the sugar-cane is not saccharose, but glucose, which is not available for sugar; whereas in beet there is little or no glucose at all, nearly the whole of the saccharine matter being saccharose. Beet-sugar, discovered by Markgraf, was manufactured about 1800 at Breslau, but the process was made a practical success by Chaptal and Delessert in 1811-12. The beet grows admirably in Britain and in Ireland; non-success in the manufacture is attributed rather to lack of method and organisation than to insufficiency of sunshine for ripening the saccharine element. The first modern factory in Britain was established in 1913. After extraction of sugar the dried slices are used as cattle-food. See J. W. Robertson Scott, *Sugar-beet* (1912).

Beet-fly (*Anthomyia betæ*), a dipterous insect which sometimes infests crops of beet or mangold-wurzel. In spring the very small eggs are laid in patches on the under surface of the leaves. The hatched maggots, which are about a third of an inch long, devour the soft parts, and after about a month of voracious life become pupæ, which are

usually buried in the ground. In about a fortnight the flies appear, measuring about half an inch from tip to tip of expanded wings. There seem to be two or more broods, and the last set of pupæ remain as such during the winter. It has not been noted as a frequent pest in Britain, but did great damage in 1880. Dressing with guano, soot, and especially superphosphate, was found efficacious. The genus includes a large number of forms. Compare CABBAGE-FLY, TURNIP-FLY, POTATO-FLY; and Miss Ormerod's *Injurious Insects*.

Beethoven, LUDWIG VAN, one of the greatest of musical composers, was born at Bonn, December 16, 1770. The family was originally Dutch, from near Louvain. The father was a tenor singer in the elector's band at Bonn, at £25 a year, a man of irregular life and severe temper. The mother appears to have been of no account. Ludwig's teachers were his father, Pfeiffer, and Van den Eeden and Neefe, both court-organists; also Ries for violin, and Zambona for letters. He was soundly and solidly taught, except in counterpoint, but was not precocious. Thus his first symphony dates from his 31st year, an age at which Mozart had written forty-five, including many of his greatest works. He joined the band, April 26, 1783, as accompanist, and on June 27, 1784, was made second organist. In 1787 he paid a short visit to Vienna and played to Mozart. About this time he began to be intimate with Count Waldstein and with the Breuning family, at Bonn. In 1788 the elector remodelled his band, and formed a national opera, at which the best works were performed. Beethoven played the viola in it, and Reicha, Ries, and Romberg were members. On November 20, 1789, the father's salary was transferred to Ludwig, and he became head of his family. In 1790 he wrote a cantata on the death of Joseph II. (not discovered till 1884). In the Christmas of that year he first saw Haydn. In 1791 we first hear of Beethoven's extempore playing, and he is already using the sketch-books so characteristic of him. In July 1792 Haydn again passed through Bonn, and warmly praised and encouraged him; and very shortly afterwards the elector sent him to Vienna to study under that great composer. He left Bonn in November, at the end of his twenty-second year. His compositions up to this date were unimportant; the cantata, two string Trios (ops. 3 and 8), two easy Sonatas (op. 49), the two piano Rondos (op. 51), are all that can be said to survive. But though thus backward, his character and his musical knowledge were fast maturing and consolidating. He displays the obstinacy, the humour, the absorption, the power of attachment of his later life; the best people of Bonn are devoted to him, and all believe strongly in his future. He is already one of the finest extempore players of the day.

In November 1792 he is established in Vienna, taking lessons in counterpoint from Haydn, and, during Haydn's absence in London, from Albrechtsberger; also from Schuppanzigh on the violin. He learned also from Salieri and E. A. Förster. In July 1795 he published the three Trios (op. 1); and on March 9, 1796, the three piano Sonatas (op. 2); the two piano Concertos in B flat and C were composed before April 1795; *Adelaide* was written that year; the Sonata in E flat (op. 7) was published October 1797; that in D (op. 10, No. 3), September 1798, &c.

Henceforward his works are composed in regular succession:

1800. Six String Quartets; C minor Concerto; Symphony No. 1; Septet; *Prometheus*; *Mount of Olives*.
1801. Quintet in C; Sonatas ops. 26, 27, 28.

1802. Symphony No. 2; Sonatas, piano and violin, op. 30. His deafness becomes serious. Letter called 'Beethoven's Will,' dated October 6.
1803. *Kreutzer* Sonata; piano Sonatas, op. 31.
1804. *Eroica* Symphony; *Waldstein* and *Appassionata* Sonatas.
1805. *Fidelio* produced November 20 (Overture 'No. 2'); piano Concerto in G; three Quartets, op. 59. This year the French occupied Vienna.
1806. *Fidelio* (2d version, Overture 'No. 3'); Symphony No. 4; violin Concerto.
1807. Overtures *Coriolan* and *Leonora* 'No. 1;' Mass in C.
1808. Symphonies 5 and 6; piano Trios in D and E flat; Choral Fantasia. This year brought an offer from King Jerome Bonaparte to direct his music at Cassel, but it ended in a guarantee from the Archduke Rodolph and Princes Lobkowitz and Kinsky to pay him an annual income of 4000 paper florins—at that time worth £210.
1809 was the year of Aspern and Wagram, and the second French occupation of Vienna; but composition went on, and we find the piano Concerto and Quartet in E flat, the Sonatas in F sharp and E flat (op. 81a), and many small works. Haydn died May 31.
1810. *Egmont* music; the Quartet in F minor, besides some small military pieces.
1811 produced the piano Trio in B flat; the music to *King Stephen*, and the *Ruins of Athens*. The latter part of this summer he spent at Teplitz.
1812. Symphony No. 7, May 13; second visit to Teplitz, Carlsbad, and Franzensbrunn; meeting with Goethe; returns by Linz, where he completed the 8th Symphony, and two pieces for trombones, to Vienna; Sonata for piano and violin, op. 96, completed and played at Vienna before the close of the year.
1813. Battle of Vittoria, June 21; composition of the *Battle Symphony*, produced with Symphony 7 at a great concert, December 8. Summer spent at Baden.
1814. Symphony No. 8 produced February 27; *Fidelio* rewritten, and given May 23; Sonata, op. 90, August 16; Overture, op. 116, October 4; Congress at Vienna; Cantata, *Der glorreiche Augenblick*, November 29; *Tournament* music (unpublished), November 23. Lawsuits with Maelzel and with Count Kinsky's heirs—the beginning of troubles.

Up to this date, notwithstanding the drawbacks consequent on his deafness, which was now total, he seems on the whole to have enjoyed life. The next period was a far more painful struggle.

1815. Troubles still continue. Quarrel with Stephen Breuning. Death of his brother Carl, November 15. Compositions few; Sonatas, piano and 'cello, op. 102; *Meeresstille*; Sonata, op. 101; arrangement of Scotch songs.
1816. *Liederkreis* composed, April. Lawsuit with Carl's widow; appeals; terrible troubles. Lawsuit with Professor Lobkowitz; pension reduced to £110; Philharmonic Society buys Overtures *Ruins of Athens*, *King Stephen*, and op. 115, for £78, 15s. Last appearance in public, April 20.
1817. Nothing but worries and troubles. Beginning of *Choral Symphony*.
1818. Piano sent by Broadwood, February. Sonata, op. 106, and Mass in D both begun; 9th Symphony continued. Summer and autumn at Mödling; anxieties about his nephew.
1819. At Mödling; work and worries still continue.
1820. Appeal decided in his favour (January), and his nephew goes into his charge. Sonata, op. 109. Mass proceeding.
1821. Sonata, op. 110, December 25.
1822. Sonata, op. 111, January 13; Mass completed March 19; at Baden, Overture, op. 124; 9th Symphony proceeding. Reconciliation with Stephen Breuning.
1823. Symphony proceeding; 33 Variations, op. 120; Symphony finished at Baden, September 5. Visit of Weber and Benedict, October 5; Rossini-fever at its height, and neglect of all other music;

- proposal to write an opera, and worries thereon; subscriptions to Mass unsuccessful.
1824. Mass in D and 9th Symphony performed May 7. Quarrels with his best friends. Autumn at Baden. Quartet, op. 127, completed October. On returning, moves into Schwarzschanerhaus, where he died; illness in the winter.
1825. At Baden from May 2 to October 15. Quartets in A minor, op. 132, and B flat, op. 130, completed.
1826. C sharp minor Quartet, op. 131, written; young Carl banished Vienna for misdeeds; they visit Johann Beethoven at Gneixendorf; last Quartet, op. 135, composed October 30; present finale to B flat Quartet composed November; returns to Schwarzschanerhaus at Vienna, December 2; Beethoven takes to bed, which he never again leaves; receives £100 from Philharmonic Society, also Handel's works from Stumpf of London. Makes acquaintance with Schubert's music.
1827. He died March 26, at a quarter to six P.M., during a thunderstorm, and was buried on the 29th at the Währinger Friedhof, outside Vienna.

Beethoven's music has not yet become at all antiquated. *Fidelio* still fills the theatre to overflowing, and a performance of his Mass in D is still the great ambition of conductors. His symphonies are now more played than ever before, and form the staple of all orchestral concerts. The same is equally true of his quartets and trios. His sonatas are not only the test of the greatest executants; but they are the indispensable material by which thousands of humble piano students are taught; and yet no one ever wearies of them. The reason of this is partly the nature of the thoughts, apart from the extraordinary energy and the stern conciseness which animates and controls them, and which are synonymous with his name; they are always noble, simple, unpretentious, and yet containing a depth of meaning which is ever fresh; they are also free from affectation or passing triviality; they seem to reach down to the common basis of humanity—to that which lies at the bottom of every heart; and thus his melodies often have a surprisingly fresh and modern effect, as if made yesterday. At the same time they are not vulgar; they have the geniality and common-sense of Haydn's thoughts, but are of a loftier and wider cast. In his music, as in life, the serious and the humorous mix, and set off one another, as they do in the works of Shakespeare. He must not be thought of merely as a musician. He himself has told us that he always worked to a picture or a scene. His music was as truly the expression of the mental image and emotion as is the language of the greatest poet or dramatist; it was never an exercise in mere technicality. Even the complicated fugues of his latest sonatas are as full of meaning as the other and less scientific movements. In some cases the 'subjects' which form the texts of his music are abrupt and individual beyond all precedent, in others they are steeped in heavenly beauty and feeling, in both instances, because they are the representatives of corresponding emotions; and in all cases the world, which began by scoffing or shrinking, has approved them. The contrasts and varieties in the instrumentation and setting of his thoughts are truly wonderful; it is as if he had his hearers constantly in his eye, and was always thinking how his thoughts could be presented in some new light, and how the attention could be best kept up until the end of his discourse. His last works, those composed during and after the period of trouble and distress, which reached from 1815 to 1820, have something of their own—something rarely if ever found in the earlier years, and unknown in his predecessors. They seem to breathe more than beauty, energy, or variety of sound, and in some mysterious way to mingle morals with music, and to lift us into a higher

region and a keener air than any other compositions. But this cannot be explained; and no one who has felt what is meant will ask for an explanation. Another point is the extraordinary variety of the music. Not only each work, but each movement is entirely different from all the others of the same name or class; and here again is a point of resemblance to Shakespeare.

This pre-eminence is not the result of any sudden impulse or impromptu effort; on the contrary, it was the effect of enormous care and labour. Fortunately, many of his sketch-books are preserved, and they enable us to see how insatiable he was in altering and rewriting his work till he got it into exactly the proper shape, and the oftener rewritten the more spontaneous does it become in the end. There is hardly a bar in his music of which it cannot be justly said that it has been written fifteen or sixteen times. His best themes often first appear in a mere commonplace form, but by repeated alterations they are brought to their present natural and eternal shape. And when he has found the proper vehicle for his thought, he is never weary of repeating it, until, as in the Pastoral Symphony, the music seems to consist of the continual reiteration of a few pregnant ideas. His music was the expression of his great mind, and no pains were too great that could make it more noble or truly refined, or could add to its beauty. And the same attention is shown in everything. No one before was so careful to mark the intended pace, or the changes of expression, or the minutest *nuances*, or to see that his publications were correctly printed.

Beethoven was no doubt an innovator; but he was so as every original thinker must be who wants means to express what no one before has thought; only that in his case the thoughts were far greater and the expression far more varied than elsewhere. His early works can often be hardly distinguished from Mozart, and it is only by degrees that the nature of the man shows itself. (The Sonatas op. 7 and op. 10, No. 3; the Coda of Finale to Symphony No. 2, are some of these early steps.) But his innovations were legitimate, never for their own sake. He worked on the old lines till he found that he needed to enlarge or modify them. Thus he enlarged the introduction and the coda; he introduced episodes in the 'working-out'; he changed the minuet into the scherzo; he multiplied the key-relations of the movements; he introduced the chorus into the finale of a symphony; he invented the 'cycle of songs'; he put variations on a new footing, which has been adopted and extended by his successors; he initiated the modern use of 'programme-music'; and everything that he did was more serious, more thoughtful, and therefore more permanent than any one else's. At the same time, it is pure music of the grandest, most touching, and beautiful sort. While adhering to the framework which seems essential for all art that is to appeal to the race and not to cliques of individuals, he shows that such framework need be no impediment to the most passionate, most personal, most universal ideas. Other men have followed the road which he opened, and have carried still further his extensions of form; but no one has done it with the same powers, or with such unabated freshness, or has met with such wide recognition by all hearers and all minds of whatever tendencies or constitution. We often hear of 'Beethoven's three styles.' It means that he began writing as his predecessors wrote; that by degrees his own genius asserted itself and made his music stronger, broader, more deeply coloured, more beautiful, than music had ever been before; and that lastly his deafness, his poverty, the troubles of life, the

approach of the end, brought a peculiar and unearthly sentiment into his thoughts.

He accepted the orchestra as he found it, for the trombones were nobly employed by Mozart, and the double bassoon formed a part of the orchestra at Bonn, and was also used by Haydn. But there is much of the highest interest in his employment of the various instruments. Every one is sooner or later immortalised—the drum in the 4th Symphony, and in the E flat Concerto; the horn in the *Eroica*, 7th and Choral Symphonies; the bassoon in the 8th Symphony; the trombones in the *Benedictus* of the Mass in D, and so on. The orchestra of the 2d Symphony is obviously founded on that of *Figaro*, but in the *Eroica* all that is changed.

He raised the *status* of musicians as much as he had enlarged the bounds of the art. Mozart and Haydn had been salaried lackeys, but Beethoven would be no man's servant, and by his mere independence, and some secret spell which counteracted all his discourtesy, compelled the highest classes of Vienna to treat him as an equal. No one before or since can show such a list of dedications of his works, and all were apparently purchased by regard and not by money.

His character was simplicity itself; falsehood was absolutely foreign to his nature, and he carried truth and sincerity into *brusquerie*, and often into shocking rudeness. The books are full of stories of this, which cannot be given here. And yet, so great was the influence of his personality, that those to whom he was rudest were fondest of him. Princes, cardinals, high-born beautiful ladies, women like Rahel, and men like Goethe, were devoted to him, and put up with every unpunctuality and every incivility. Varnhagen von Ense, after several weeks' intimate communication, 'found the man in him much stronger than the artist.' His simplicity sometimes became credulity, blinded him to real facts, and made him often unfair and harsh. This showed itself unjustifiably towards his relations, and towards many of his best and truest friends. Such conduct must have been greatly due to his deafness, his sensitive nature, and his absorption in his music, and he was always ready to confess his error; he was full of the deepest feeling, and there is something wonderfully touching in his devotion towards his nephew, one of the meanest, most graceless scamps on record; but on whom, partly because he was left to him, partly because of his craving for affection, he lavished all his tenderness. His nature and his deafness drove his goodness inwards, and we must look to his music, and to the mystical aspirations with which he salutes God in the sunrise, or the beauty of the woods, for the deeply religious feelings of his great heart.

Though a Catholic by birth, and dying in that faith, he had little formal religion. And yet a more deeply religious mind never existed. In every trial his thoughts flew upwards, and his note-books are full of the most passionate ejaculations. God was to him the most solemn and intimate reality, whom he saw and welcomed through all aspects of nature, and in every mood of joy and sorrow. Living in a profligate city, and in a time of the loosest morals, and himself singularly attractive to women, his name is not connected with a single *liaison* or scandal. 'It is one of my first principles,' says he, 'never to stand in any relations but those of friendship with another man's wife.' Again, 'O God! let me find the woman who is destined to be mine, and who shall strengthen me in virtue.' He wrote no second opera because he could get no libretto of the virtuous, elevating cast which he thought essential, and which alone he would consent to set.

Beethoven was 5 feet 5 inches high, very broadlv

and firmly built; his head large, and the hair black, thick, and abundant. His eyes were dark in colour, very bright, and peculiar.

[The standard life by the American A. W. Thayer (3 vols. 1866-87), published in German, was partly rewritten and continued by Deiters (1901-7), finished (vol. v. 1908) by Riemann, and again, from Thayer's material, edited by Krehbiel (New York, 3 vols. 1921). See also the article in *Grove's Dictionary of Music and Musicians* and *Beethoven and his Nine Symphonies* (1896) by Sir G. Grove, writer of the preceding article; Schindler, *Biographie von Beethoven* (1860); Nohl, *Beethoven described by his Contemporaries*, and his *Life and Works of Beethoven* (trans. 1880 and 1881); *Beethoven's Letters* (trans. by Lady Wallace, 1866); also books on him by Rudall (1889), Crowest (1899), Von Frimmel (1901), Shedlock (1903), E. Walker (1905), D. G. Mason (1905), and D'Indy (trans. 1914). In 1889 the birth-house at Bonn was converted into a Beethoven museum.

Beetle, the name of an order of insects technically known as Coleoptera (the Middle English *bitula* or *bitela* is apparently from an adj. *bitul* or *bitel*, 'biting'). There are indeed some insects popularly called 'beetles' which are not Coleoptera, and some Coleoptera which would hardly be termed 'beetles,' but for practical purposes the two words are synonymous. They have generally the usual four wings, but the front pair form hard and horny covers for those behind, which alone are used in flight. The feelers or antennæ have only a few joints; the jaws or mandibles are almost always biting organs like those of the Cockroach (q.v.), and the fourth pair of mouth appendages (second pair of maxillæ) are completely fused together (see the article INSECTS in Vol. VI. of this work, and the illustration, figure 1, there). Beetles have a complete metamorphosis; the larvæ are usually grub-like, with or without legs; the pupæ are usually soft, with freely exposed appendages, with or without cocoons. There are about 150,000 described species of beetles, showing great variety in detail, both of structure and habit. They are conveniently divided into sub-orders, such as the Lamellicornes (e.g. scarabæes), the Rhynchophores (e.g. weevils). Most beetles are decidedly strong, voracious insects, acting as 'universal scavengers,' preferring to remain concealed during the day, and only on occasions taking to flight. Their food varies greatly from hard wood to soft fruits, from the carcasses of animals to dung, and a few become parasites. They are found in water and on land, on plants and among stones, burrowing in the ground and drilling holes in wood, in fact in almost every variety of habitat. Fossil-beetles begin to appear in the carboniferous strata, and are often found imbedded in amber. Their practical importance in regard to vegetation, and their numerous interesting peculiarities of form and habit, will be discussed under special articles.

See the following articles on various beetles:

Bark-beetles.	Death-watch.	Meal-worm.
Blaps.	Devil's Coach-horse.	Oil-beetle.
Blister-beetle.	Dung-beetle.	Scarabæus.
Burying Beetle.	Firefly.	Stag-beetle.
Cantharis.	Glow-worm.	Water-beetles.
Cockchafer.	Ladybird.	Weevil.
Colorado Beetle.		Wire-worm.

Beetling. In some rural districts of Scotland the peasantry, when they have not ready access to a mangle, beat clothes, newly washed and dried, with a wooden mallet on a flat stone, and the operation is called beetling. The same term is applied to a finishing process in the manufacture of linen, and also of some kinds of cotton goods. Just as in the hammering by hand, the object is to fill up and give a finish to the cloth by flattening its surface. It is done by the rising and falling of upright wooden stamps, placed close together in a row, with their square butts resting on a roller over which the cloth passes under them. The stamps

are worked by the rotation of a horizontal shaft, acting with tapets, like the cylinder of a barrel-organ.

Linen weft yarns, and especially such as are used for heavy sail-cloth, are also beetled by this machine to soften them. But finer weft yarns of this material are now, instead of being beetled, passed through what is called a *softening machine*, which consists of two pairs of grooved wooden rollers with the requisite driving gear.

Beet-root Sugar. See BEET and SUGAR.

Beets, NICOLAUS, Dutch poet and writer, was born at Haarlem, 13th September 1814, and studied theology at Leyden. After serving at Heemstede, near Haarlem, he was in 1854 appointed to the pastorate of Utrecht, and in 1874 to the chair of Theology there. His poetical works have been collected (4 vols. 1873-81). Through the earlier pieces runs a strong vein of misanthropic sentiment, due probably to Byron, some of whose works he translated into Dutch (2 vols. 1835-37). His prose writings include *Camera Obscura* (13th ed. 1880), a series of tales and sketches of life and scenery in Holland, published under the pseudonym of 'Hildebrand'; they display keen observation and are extremely droll—he was called 'the Dutch Dickens.' He published also a number of theological and critical works; and he died 12th March 1903.

Befana, a corruption of *Epiphania* (Epiphany), which name in Italy has become personified for children as a toy-bringing old woman called *la Befana*. She is a kind of female counterpart of the Wandering Jew and Santa Claus combined, and is employed as a kind of bugbear to frighten naughty children. According to the popular story, she was busy cleaning the house when the three wise men of the East passed by on their way to offer their treasures to the infant Saviour, and when called to the window to see them, she said she could do so when they returned. They went home by another way, and she has ever since been watching for their return. On Twelfth Night she brings good children toys and sweetmeats, but bad children only find their stockings full of ashes. It was also customary in Italy, on the evening before the Epiphany (5th January), to carry an effigy called the *befana* in procession through the streets amid great rejoicings, but this has fallen greatly into disuse.

Beffroi. See BREACHING TOWER.

Beg, now always BEY ('lord'), a Turkish title, rather vague in its import, and commonly given to superior military officers and distinguished foreigners. In rank it stands between *Effendi* and *Pasha* (q.v.). It is often assumed without any authority, and nearly every young Turkish dandy allows himself to be addressed by the title. 'Beglerbeg,' or, more correctly, *Beilerbegi* ('lord of lords'), is the title given to the governor of a province.

Begas, KARL, court-painter to the king of Prussia, was born near Aix-la-Chapelle in 1794. He painted a great many biblical subjects for churches, as well as several historical pictures and portraits. He died November 23, 1854. Of his four sons, two became known as painters, and two as sculptors.

Begg, JAMES, D.D., born in 1808 at New Monkland manse in Lanarkshire, was educated at Glasgow University, and was licensed as a preacher in 1829. Minister of Liberton from 1835 to 1843, he 'came out' at the Disruption, and thenceforward to his death (29th September 1883) held the neighbouring Free Church of Newington, Edinburgh.

A man of fine presence and vigorous intellect, he distinguished himself by his old-world orthodoxy, his humour and combativeness, and his efforts to improve the houses of the poor. See the Memoir by Professor T. Smith (2 vols. 1885-88).

Beggar. See MENDICANCY, VAGRANTS.

Beggar-my-neighbour, a game at cards played by two persons, between whom the pack is equally divided. Holding their cards back-upwards, the players lay down a card alternately, till an honour is turned up, which is paid for by the adversary—four cards for an ace, three for a king, two for a queen, and one for a knave. Such payment being made, the winner lifts the trick; but if an honour is laid down during the payment, then the opposite party must pay for that in the same way; and so on, till a payment is made without an honour. The object is to win all the cards in the pack. The game is as old at least as 1777.

Beghards. Societies of laymen under this name first appeared in Germany, the Netherlands, and the south of France in the beginning of the 13th century, and were known in Italy as *Bizachi* and *Bocasoti*; but they never obtained the reputation enjoyed by the Beguine sisterhood. Towards the end of the 13th century they were commonly stigmatised as *bons garçons, boni pueri*, and such contemptuous titles, which expressed the low estimation in which they were held. On account of heretics of all sorts retreating into these half-spiritual communities, they were subjected to severe persecutions after 1367, and were gradually dispersed, or joined the orders of Dominicans and Franciscans. In the Netherlands, where they had preserved a better character than elsewhere, they maintained their ground longer, and were protected by Pope Innocent IV. (1245), in Brussels by Cardinal Hugo (1254), and in Liège by Pope Urban IV. (1261); but their communities disappeared in the 14th century. The most probable origin of our word *beggar*, according to Sir J. A. H. Murray, is none other than the old French *begart, begard*, or its synonym, *beguin*, whence the verb *beguigner, beguiner*, 'to act the beguin.' If this etymology be true, it serves to show how widely these lay mendicants must have been spread over Western Europe. See BEGUINES, and the article by Haupt in Hauck-Herzog there cited.

Begharmi. See BAGIRMI.

Beglerbeg. See BEG.

Begonia. This genus (which gives its name to a small order of doubtful affinities) contains a



Begonia rex.

large number of species which are cultivated in our greenhouses, partly on account of their usually

pink, unisexual flowers, and partly for their remarkable unequal-sided and often coloured leaves, to which they owe such various popular names as 'Elephant's ears' in the East Indies, or, more poetically, 'Angel's wings' in the Spanish Antilles and Mexico. They are almost all tropical plants; but a small species of *Begonia* ascends the Himalayas to at least 11,500 feet, often growing on the trunks of trees. The leaves and young stems are succulent and acid, and those of several species are used as pot-herbs or in tarts like rhubarb. The roots of some are used in their native countries as astringents, and some of the Mexican species are used as drastic purgatives. According to Loudon, begonias were introduced into Great Britain from Jamaica in 1777, but they were little cultivated till 1840.

Beg-Shĕhr, or KERELI GÖL, an extensive mountain lake in Asia Minor, 44 miles SW. of Konia, situated almost 3700 feet above the sea. It is over 30 miles long, and from 5 to 10 miles broad, and contains several islands. Its only visible outlet is a rivulet connecting it with the much smaller lake, Soghla Göl, the waters of which occasionally disappear altogether; and it is evident that a great part is carried off through subterranean channels in the limestone range of the Taurus. On its east and north shores are the towns of Begshehr and Kereli.

Beguines (BEGUINÆ, BEGUTTÆ), a sisterhood within the Catholic Church, first formed during the 12th century in the Netherlands. The origin of the word is doubtful. It is ascribed by some to a St Begga, who is said to have founded the first sisterhood in 696; by others to a priest named Lambertus le Begues or le Beghe, who founded in Liège, about 1180, a society of pious women who were called by his name. The Beguines were not restricted by vows, nor did they follow the rules of any order, but were united under a superior for the exercise of piety and benevolence, and lived generally in separate small cottages, which, collectively, formed the *Beguinagium*. Their establishments were often enriched by liberal donations. A church, a hospital, and a house of reception or common entertainment, generally belonged to every community. The sisters were distinguished from the rest of the laity only by their diligence and devotedness, piety, modesty, and zeal for the purity of youthful education. Their most flourishing period was during the 12th and 13th centuries, when they spread themselves widely over France, Germany, and the Netherlands. As the pietists of the middle ages, they were often subjected to persecution by the mendicant orders of friars; but on account of their practical usefulness were long sheltered by the popes and councils as well as by the secular authorities. In the 13th and 14th centuries, through their sympathy with the persecuted Fraticelli (q.v.) and the 'Brethren and Sisters of the Free Spirit,' they were brought under the scrutiny of the Inquisition; and on account of certain immoralities, a synod held at Fritzlar in 1244 required that all candidates must be forty years old before they could enter a society of Beguines. These sisterhoods maintained their position in Germany and the Netherlands longer than in other countries. In Holland, they existed at the close of the 18th century. In Belgium there are beguinages at Antwerp, Bruges, and Mechlin, and two at Ghent. Of the latter, the larger forms a separate quarter of the town, with little brick-built cottages, convents and churches, arranged in streets and squares within a common wall, open to the visits of strangers. Living here a life of retirement and piety, the Beguines, in their simple dark dresses, go out as nurses to the hospitals, and per-

form other acts of kindness among the poor. Though they are under no monastic vow, it is their boast that none is known to have quitted the sisterhood. See BEGHARDS; also Haupt's article in the Hauck-Herzog *Realencyklopädie* (vol. iii. 1897), and Canon Hoornaert's *Ce que c'est qu'un Béguinage* (1922).

Begum (a feminine form corresponding to *Beg*, q.v.), an Indian title of honour equivalent to 'princess,' conferred on the mothers, sisters, or wives of native rulers. The Begum of Oudh (see HASTINGS, WARREN) is well known in Indian history.

Behaim, MARTIN, a famous cosmographer, was born at Nuremberg about 1459. He early entered into mercantile life, and in 1480 went to Portugal, where he soon acquired a reputation as a skilful maker of maps. In 1484 he accompanied the Portuguese navigator, Diego Cam, in a voyage of discovery along the west coast of Africa, and sailed as far as the mouth of the Zaire or Congo River. In 1486 Behaim sailed to Fayal, one of the Azores, but in 1490 he left Fayal and returned to Nuremberg. There he constructed a large globe, principally from the writings of Ptolemy, Pliny, Strabo, Marco Polo, and 'Sir John Mandeville.' It is still preserved by the family of Behaim in Nuremberg, and is a valuable record of the progress of discovery, though it exhibits little accuracy, even for that date. He was not nearly so great a traveller as he pretended, nor an expert cartographer; the beauty of his globe was mainly due to a friend, a miniature-painter called Glockenthon. Behaim again resided in Fayal from 1494 to 1506, and died at Lisbon in 1506. His two hemispheres represent all the knowledge Columbus had to go on. See Ravenstein's monograph on him (1909).—MICHAEL BEHAIM (1416-74) was a German *meistersänger*, a native of Sülzbach, and by profession a weaver.

Beham, two brothers, natives of Nuremberg, and both of them painters and engravers—Hans Sebald (1500-50) and Barthel (1502-40). They are reckoned amongst Dürer's seven followers, the 'Little Masters,' and form the subject of a monograph by A. Rosenberg (Leip. 1875).

Behar and Orissa, or BIHAR AND ORISSA, a governor's province (under the Government of India Act, 1919), bounded by Nepal, Bengal, the Bay of Bengal, and the United and Central Provinces. It formed till 1912 part of the lieutenant-governorship of Bengal. It consists of the districts Patna, Tirhut, Bhagalpur, Chota Nagpur, and Orissa. Area, 83,181 sq. m.; pop. 34,000,000. In addition there are native states with an area of 28,000 sq. m. and a pop. of 4 millions. Hindus number 82 per cent. of the population, and Mohammedans 10 per cent. The Ganges flows through Behar, and the Mahanadi drains Orissa. Between Behar and Orissa the plateau of Chota Nagpur has an altitude of 2000 feet. The mean annual temperature ranges from 75° in Chota Nagpur to 82° at Cuttack in Orissa; the mean annual rainfall, varying from 50 inches in Behar to 58 inches in Orissa, is regular on the whole, and, except for rice cultivation, little artificial irrigation is required. Rice is the principal crop, Patna being the centre of the rice-growing areas. Other crops are wheat, barley, maize, oil-seeds, sugar-cane, indigo, tea, and tobacco. There are an agricultural research institute at Pusa, an agricultural college at Sabour, and several experimental farms in the province. About 60 per cent. of the coal output of India comes from Behar and Orissa. There are large iron-works at Singhbhum. Saltpetre is produced in considerable quantities. Other manufactures include articles of ebony inlaid with ivory and horn, silk and mixed silk and cotton fabrics, gold and filigree work, brass utensils, carpets, coarse cloths, &c. The capital is Patna

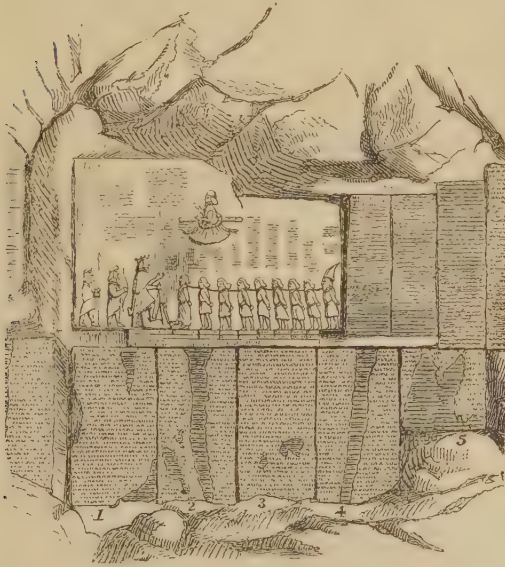
(q.v.). The other principal towns are Bhagalpur, Cuttack, and Darbhanga.

Behar, or **BAHAR**, a town of Behar, 54 miles SE. by S. of the town of Patna. The original city is nearly deserted, and the present town consists of houses scattered about its remains, and interspersed with fields, gardens, and groves. There are some remains of fine mosques. Behar has a considerable trade, chiefly in rice, European cloth, cotton, and tobacco; while silk, cotton cloths, and muslin are manufactured here. Pop. 48,000.

Beheading. See EXECUTION, GUILLOTINE.

Behemoth (Heb., plural of *b'hēmāh*, 'beast,' a word of Egyptian origin), the name of a large and strong four-footed beast, referred to once in the Old Testament Scriptures, Job, xl. 15-24. Gesenius proves that the description in the passage is more suitable to the hippopotamus than to any other animal, though the elephant has been suggested by some scholars.

Behistun, or **BISUTUN** (ancient *Baghistan*), the site of an ancient Persian city, 22 miles E. of the city of Kirmanshahan. It is noted for its famous precipitous rock, anciently known as Mount Bagistanus, which on one side rises perpendicularly to the height of 1700 feet. Diodorus relates that Semiramis encamped near the rock, and caused the lower part to be smoothed away and an inscription engraved on it in her honour. This, like many other traditions attached to the mythic queen, is now proved false. The rock bears inscriptions of Darius Hystaspes about 518 B.C. The inscriptions—which are in the three forms of cuneiform writing, Persian, Babylonian, and Median—set forth the hereditary right of Darius to the throne of Persia, tracing his genealogy, through eight generations, up to Achæmenes; they then enumerate the provinces of his empire, and recount his triumphs over the various rebels who rose against him during the first four years of his reign. The monarch himself is represented on the tablet with a bow in hand, and his foot upon



Rock Inscriptions at Behistun.

the prostrate figure of a man, while nine rebels, chained together by the neck, stand humbly before him; behind him are two of his own warriors, and above him, another figure (see cut). The Persian

inscriptions which Sir H. Rawlinson translated are contained in the five main columns numbered in cut 1, 2, 3, 4, 5. The first column contains 19 paragraphs and 96 lines. Each paragraph after the first, which commences, 'I am Darius the Great King,' begins with, 'Says Darius the King.' The second column has the same number of lines in 16 paragraphs; the third, 92 lines and 14 paragraphs; the fourth has also 92 lines and 18 paragraphs; and the fifth, which appears to be a supplementary column, 35 lines. The second, fourth, and fifth columns are much injured. Rawlinson fixed the date at 516-515 B.C.

See Rawlinson in *Journal of Royal Asiatic Society*, vol. x.; Jackson's *Persia Past and Present* (1907); and *The Sculptures and Inscriptions at Behistun*, by King and Campbell Thomson (who recopied them, 1907).

Behm, DR ERNST, a German geographer, was born January 4, 1830, at Gotha, where he died on the 15th of March 1884. In 1856 he became Dr Petermann's chief assistant in editing the famous geographical periodical, *Mitteilungen*, to the editorship of which he succeeded on his chief's death in 1878. In 1872 he commenced, in conjunction with H. Wagner, the useful *Bevölkerung der Erde* (vol. vii. 1882), intended as a statistical supplement to the *Mitteilungen*; and from 1876 he undertook the statistical department of the *Almanach de Gotha*. His more extended writings of this nature are full, accurate, and lucid.

Behmen. See BOEHME, JAKOB.

Behn, APHRA, the first English professional authoress, was born in 1640 at Wye, in Kent, the daughter of John Amis (not Johnson, a barber, as long believed), with whom as a child she sailed for Surinam. Her father, well connected, had the promise of a good post, but died on the voyage out. His wife and family settled in Surinam, and there Aphra met Oroonoko, 'the royal slave,' whose romantic story she was afterwards (1688) to combine with autobiographical matter in a novel which made her the first literary abolitionist and left its mark on Bernardin de Saint Pierre, Chateaubriand, Rousseau, and others. Returning to England about 1663, she married a merchant of Dutch extraction called Behn, but, already widowed by 1666, turned spy for a livelihood, and went to Antwerp, whence she sent naval and other information to the government. Left without funds and imprisoned for debt, 'Astrea,' as she called herself, abandoned the Secret Service when set at liberty, and quickly made her name in literature. Her first play, *The Forc'd Marriage*, was given late in 1670; of her score of dramatic works *The Rover* is perhaps best known. Her good looks, her conversation, won her friends—and enemies—among the greatest wits and highest society of the day. Her comedies, full of verve, enjoyed vast popularity, but later came to be a byword for licentiousness, and were neglected accordingly. She died 16th April 1689. Her works were edited by Montague Summers (6 vols. 1915).

Behring, or **BERING**, VITUS, a famous navigator, born in 1680, at Horsens, in Denmark. He entered early the newly-formed navy of Peter the Great, and for the ability and daring he displayed in the wars with Sweden, was appointed to conduct an expedition of discovery in the Sea of Kamchatka. Sailing in 1728 from a port on the east of Kamchatka, he followed the coast northward until he believed, from the westward trending of the land, that he had reached the north-east point of Asia. After some years spent in explorations on the coasts of Kamchatka, Okhotsk, and the north of Siberia, he sailed in 1741 from Okhotsk towards the American continent, and sighting land about 58½° N. lat., he followed the coast northward for some distance; but sickness

and storms obliged him to return, and being wrecked on the desert island of Avatcha, since called Behring Island, he died there, December 19, 1741. Among the few who escaped, in a boat made from the wreck, was Steller, the naturalist, who has left an account of the voyage (St Petersburg, 1793).

Behring Strait separates Asia from America, and connects the Pacific with the Arctic Ocean. The proof that the two continents were not connected was given by a Cossack named Deschnev, who in 1648 sailed from a harbour in Siberia, in the Polar Ocean, into the Sea of Kamchatka. But his voyage was long regarded by Europeans as a fable, until Behring's (q.v.) expedition in 1728. The strait was explored and accurately described by Cook in 1778. The narrowest part is near 66° lat., between East Cape in Asia, and Cape Prince of Wales in America, where the capes approach within 36 miles; about midway are three uninhabited islands. The greatest depth is some 30 fathoms. Haze and fogs are the normal conditions of the atmosphere.—**BEHRING SEA**, a part of the North Pacific Ocean, commonly known as the Sea of Kamchatka, bounded W. by Kamchatka, E. by Alaska, S. by the Aleutian Islands, and N. by Behring Strait. There are several islands in this sea, and here also fogs prevail.—**BEHRING ISLAND**, the most westerly of the Aleutian Islands, barren and destitute of wood, but an important station of the Alaska fur industry. It has an area of 30 sq. m., and is noteworthy as the place where Behring, the discoverer, was wrecked and died in 1741.

Beilan', a pass in the northern extremity of Syria, on the east shore of the Gulf of Scanderoon, runs across the mountain-range of Amanus. It is the common route from Cilicia into Syria, and gave a passage to Alexander the Great, and afterwards to the Crusaders, into Syria. The town of Beilan (pop. 5000) is situated near the summit-level of the pass, at an elevation of 1584 feet above the Mediterranean Sea.

Beira, a Portuguese province, bounded N. by the provinces of Minho and Tras-os-Montes, S. by Estremadura and Alemtejo, E. by Spain, and W. by the Atlantic Ocean. It has an area of about 9222 sq. m., and a population of 1,800,000. The surface is mountainous, and the soil on the plains sandy, and generally far from fertile. The mountain-slopes afford good pasturage for sheep and cattle, and from the hogs of Beira are made the well-known Lisbon hams. The products are corn, wine, honey, oil, flax, and various kinds of fruit. Sea-salt is obtained at the coast. The river Douro waters the whole of its northern, and the Tagus a portion of its southern boundary. Iron, coal, and marble are wrought in small quantity, and mineral springs are numerous. The province embraces the districts of Aveiro, Castello Branco, Coimbra, Guarda, and Vizeu. The capital is Coimbra.

Beira, a small town (pop. 10,000) in Portuguese East Africa, near the mouth of the Pungwe (q.v.) River, whence run railways to Mashonaland and to the Zambesi (for Nyasaland).

Beiram. See BAIRAM.

Beirut. See BEYROUT.

Beit is an Arabic word, signifying 'house,' 'abode,' or 'place,' the Hebrew equivalent of which is *Beth*. In both languages it is employed in place-names; thus, in the former, we have *Beit-al-Haram*, 'the house of the sanctuary,' or 'the sacred house;' and in the latter, *Beth-el*, 'house of God;' *Beth-any*, 'house of dates;' *Beth-abara*, 'house of the ford;' *Beth-lehem*, 'house of bread,' &c. See also BETHESDA, BETHSAIDA.

Beit-el-Fakih, a town of Yemen in Arabia, 50 miles SE. of Hodeida (q.v.). Pop. 8000.

Beith, a small town of North Ayrshire, on the borders of Renfrewshire, 18 miles SW. of Glasgow by rail. Its most notable manufacture is that of furniture in large cabinet-works. The chief building is the Speir School (1887), resembling the old college at Glasgow. Pop. 5000.

Beitullah (Arab., 'house of God'), the spacious building or temple at Mecca, which contains the Kaaba. See MECCA and KAABA.

Beja (the *Pax Julia* of the Romans), a town in the province of Alemtejo, Portugal, 101 miles SE. of Lisbon by rail. It has a castle and a cathedral, and manufactures of leather and earthenwares. Among its interesting Roman antiquities, the chief are the south gate and an aqueduct. Pop. 10,000.

Bejan, or **BAJAN**, the name of the first or 'freshman' class in the Scottish universities of St Andrews and Aberdeen, and of old in many continental universities. The word is believed to be derived from the French *bee-jaune*, 'yellow beak,' a term used to designate a nestling or unfledged bird. The levying of *bejanina*, or payments for 'first-footing' by students on entering college, was forbidden by the statutes of the university of Orleans in 1365, and of the university of Toulouse in 1401. The election of an *Abbas Bejanorum*, or 'Abbot of the Greenhorns,' was prohibited by the statutes of the university of Paris in 1493. *Beamus* is another form.

Bejapur. See BIJAPUR.

Bejar, a town of Spain, 45 miles S. of Salamanca. It has cloth manufactures and an annual fair; and in the neighbourhood is a hot sulphur-spring. Pop. 10,000.

Bek, **ANTONY**, Bishop of Durham from 1283, took a prominent part in the Scottish wars of Edward I., and held a command at the battle of Falkirk. In 1300 he became involved in ecclesiastical disputes, which lasted till his death on 3d March 1311. He was a prelate of great magnificence and unbounded ambition, but chaste and liberal.—Another Antony Bek (1279–1343) was Bishop of Norwich from 1337; a Thomas Bek (died 1293) was Bishop of St David's from 1280; and a second Thomas Bek (1282–1347) was Bishop of Lincoln from 1342.

Bekaa. See CELE-SYRIA.

Beke, **CHARLES TILSTONE**, Abyssinian explorer and biblical critic, was born in London, October 10, 1800; received a commercial education; afterwards studied law in Lincoln's Inn, and devoted a great part of his attention to ancient history, philology, and ethnography. The results of these studies first appeared in his work, *Origines Biblicae*, or researches in primeval history (vol. i. 1834), which was an attempt to reconstruct history on the principles of the science of geology, and which gained him the Tübingen degree of doctor of philosophy. In 1837–38 he acted as British consul in Saxony. His historical and geographical studies of the East led Beke to consider the great importance of Abyssinia for intercourse with Central Africa. Supported only by private individuals, he joined in Abyssinia the party led by Major Harris, and distinguished himself (1840–43) by the exploration of countries lying to the south, previously almost unknown in Europe. He fixed the latitude of more than seventy stations, and mapped about 70,000 square miles of country. He also collected the vocabularies of many languages and dialects. The results of these researches appeared in *Abyssinia* (1845) and in various journals. Having returned to Europe, he excited the attention of geographers by his *Essay on the Nile and its Tributaries* (1847). In 1853 he had become partner in a Mauri-

tius mercantile house, and in 1856 he made unsuccessful attempts at establishing commercial relations in Abyssinia. In 1861 Dr and Mrs Beke journeyed in Palestine; and undertook in 1865 a fruitless mission to Abyssinia, to obtain the release of the captives. In 1870 he was granted a pension on the Civil List. At the commencement of 1874, Dr Beke started for the region at the head of the Red Sea, where he claimed (though his views are disputed) to have discovered Mount Sinai, east of the Gulf of Akabah, and not west as generally supposed. He died at Bromley, Kent, July 31, 1874, being engaged at the time on an account of his journey to Sinai, and a second volume of his *Origines Biblicæ*. Beke in 1852 edited, for the Hakluyt Society, De Veer's *Three Voyages towards China*; he also published *The Sources of the Nile* (1860); *British Captives in Abyssinia* (1865); *King Theodore* (1869); *Idol in Horeb* (1871); *Jesus the Messiah* (1872). His posthumous work, *Discoveries of Sinai in Arabia* (1878), was issued by his widow.

Békés, or **BÉKÉSVAR**, a town of Hungary, at the confluence of the Black and White Körös, 113 miles SE. of Budapest. The inhabitants principally engage in agriculture, and trade in cattle, corn, and honey. Pop. 28,000. See also CSABA.

Bekker, IMMANUEL, a scholar distinguished by his recensions of the texts of Greek classics, was born at Berlin in 1785, studied in Halle, and in 1811 became professor of Philology in his native city, where he died 7th June 1871. The results of his researches in the libraries of France, Italy, England, and Germany, appear in his numerous recensions of texts derived solely from MSS., and independently of printed editions. The writers included in these recensions are Plato, the Attic orators, Aristotle, Thucydides, Theognis, Aristophanes, as well as Livy and Tacitus.

Bekker, BALTHASAR (1634-98), pastor at Amsterdam, wrote against the belief in Witchcraft (q.v.)

Bektashi. See DERVISH.

Bel and the Dragon, an apocryphal book of the Old Testament, originally appended to the Book of Daniel. It first appears in the Septuagint, and does not seem to have been accepted as inspired by the Jewish Church, nor is there any proof that a Hebrew or Chaldee version of the story ever existed. Jerome considered it a 'fable,' an opinion in which most modern readers will coincide. It was, however, one of the books declared canonical by the Council of Trent (1546). The aim of the writer appears to have been to warn against the sin of idolatry some of his brethren who had embraced Egyptian superstitions. See APOCRYPHA.

Belbeis (ancient *Bubastis Agria*), a town situated on the east arm of the Nile, Lower Egypt, 30 miles NNE. of Cairo; pop. 12,000.

Belcher, SIR EDWARD, admiral, born in 1799, entered the navy in 1812, and in 1816 took part in the bombardment of Algiers. In 1825 he was appointed assistant-surveyor to the expedition about to explore Behring Strait under Captain Beechey; and from 1836 to 1842 he commanded the *Sulphur*, commissioned to explore the western coast of America. Knighted in 1843, and for five years employed on surveying service in the East Indies, he was in 1852 appointed to the command of the unfortunate expedition sent out by government to search for Sir John Franklin. Belcher published *Narrative of a Voyage round the World in the Sulphur* (1843); *Narrative of a Voyage to the East Indies* (1848); *The Last of the Arctic Voyages* (1855), &c. In 1861 he became rear-

admiral of the Red, in 1866 vice-admiral, in 1867 K.C.B., and rear-admiral in 1872. He died 18th March 1877.

Belchit'é, a town of Spain, on the Aguas, 22 miles SSE. of Saragossa. Here, on June 18, 1809, the French, under Suchet, completely routed the Spanish under General Blake.

Belem'. See LISBON.

Belem', or **PARÁ**, capital of the Brazilian province of Pará (q.v.).

Bel'lemnites (Gr. *belemnion*, 'a dart' or 'arrow'), an interesting genus of fossil cephalopodous Mollusca, the type of a family called Belemnitidae, to the whole of which the name Belemnites is very generally extended, and which is closely allied to the Sepiadae, or Cuttle (q.v.) family. No recent species of Belemnites is known: fossil species are very numerous, and are found in all the jurassic and cretaceous strata, from the lowest lias to the upper chalk, some of which are filled with myriads of their remains. These remains are generally those of the shell alone, which is now known to have been an internal shell, entirely included within the body of the animal, like that of the cuttle. The



Belemnites pistiliformis.

shell, as seen in the most perfect specimens, is double, consisting of a conical chambered portion (the *phragmacone*), inserted into a longer, solid, somewhat conical or tapering, and pointed sheath, which is termed the *rostrum* or *guard*. The space between the phragmacone and sheath is occupied either with radiating fibres or conical layers. The chambers of the shell are connected by a tube (*siphuncle*), so that the animal probably had the power of ascending and descending rapidly in the water. From some well-preserved specimens we learn that its body was furnished with lateral fins, and that it had eight arms and two longer tentacles. The suckers seem to have been provided with horny hooks; and these it probably fixed upon a fish, and descended with its prey to the bottom, like the hooked Calamary (q.v.) of the present seas. Horny mandibles and remains of an ink-bag, like that of the cuttle, have been found in the last and largest chambers of the belemnites; but remains of this chamber, which must have contained all the viscera of the animal, are very rarely preserved, the shell having been very thin at this part. The part most commonly found, and generally known by the name of belemnite, is the solid *guard*, or point into which the sheath was prolonged behind the chambered shell. These have received such popular names as Arrowheads, Petrified Fingers, Spectre-candles, Picks, Thunderstones, &c., from their form, or from the notions entertained of their nature and origin. Belemnites appear to have been of very different sizes; some of the largest, with arms outstretched, must have been several feet in length.

Belfast, the largest and most prosperous town in Ireland, is a great commercial and manufacturing centre; it is since 1898 a county of a city, and since 1899 a county borough, once mainly in the county of Antrim, of which from 1850 it was the county town. It is 12 miles from the Irish Sea, 101 N. of Dublin, 130 SW. of Glasgow, and 156 NW. of Liverpool. The older portion of the town stands on an alluvial deposit not more than 6 feet above the sea-level. The river Lagan is crossed by the Queen's Bridge, by the Albert Bridge, by a railway bridge, by a bridge at Ormeau, and by

the King's Bridge in ferro-concrete, more recently constructed. Belfast has a much more pleasant appearance than most British manufacturing towns. A fine street called Royal Avenue, driven in 1884 through the centre of the town from York Street to Donegall Place, contains the Post-office, the Ulster Reform Club, the offices of the Water Commissioners, the Public Library, and the Art Gallery and Museum. The Public Library has a number of branches. The Museum contains two unique collections—one of Irish antiquities, and the other the Horner collection of spindles and spinning-wheels. The Queen's University of Belfast has developed out of Queen's College, which in 1850, in affiliation with similar colleges at Cork and Galway, was incorporated as a university. In 1879 its constitution was dissolved, and the Royal University of Ireland was instituted in Dublin. During the next thirty years Queen's continued its career as a college, and in 1909 was constituted the Queen's University of Belfast. In 1881 the Presbyterian College had, in conjunction with the Magee College of Londonderry, the power conferred on it of granting theological degrees. Catholics and Methodists have colleges of their own. The Royal Academical Institution (whose centenary was celebrated in 1910) is a public high school. The Campbell College, opened in 1894, with its thoroughly equipped laboratories and workshops, furnishes a superior liberal education. The great Municipal Technical College, which began work in 1901, had twice between 1904 and 1910 to extend its five-storied building. Among its developments has been a co-ordination scheme of university education and technical education, whereby students of the institution can obtain their arts and science degrees.

Belfast is a prosperous town, the most progressive in Ireland. In 1821 the population was 37,117; in 1851 it was just over 100,000; in 1881, 208,122; in 1901 (with enlarged boundaries), 349,180; and in 1911, 386,947, of whom 75 per cent. were Protestants. In 1892 the chief magistrate had the title of Lord Mayor conferred on him, and Belfast was detached from Antrim and Down and made a county borough in 1899. The new City Hall, opened in 1906, claims to be the finest city hall in the United Kingdom; a quadrangle of classic design, it is surmounted by a dome 175 feet high, and cost over £300,000. In it were held the first meetings of the Northern Irish Parliament in 1921. In 1887 the Belfast Main Drainage Act was passed for the purpose of extending, at an expenditure of £300,000, the main trunk and intercepting sewers for collecting all the sewage and discharging it into the sea at a great distance from the town, and much has since been spent on works for purifying the sewage before discharging it. The gasworks, purchased by the corporation in 1874, and extended, have yielded a profit used in relieving local rates. Electric lighting was first installed in 1895 by the corporation. In 1905 the corporation acquired the whole of the street tramways for £364,448, and at once proceeded to electrify and extend the system from that of horse-traction. The Harbour Commissioners had already expended £500,000, when, under an act of 1883 and subsequent acts, they obtained power authorising an expenditure of over two and a half millions of money, and the entrance channel to the harbour is now deepened to 32 feet below high-water level of ordinary spring-tides. One of the graving-docks, opened in 1911, is among the largest and most convenient in the world, and is 886½ feet long by 100 feet wide on the floor. The quays extend a mile on each side of the river from Queen's Bridge. Belfast is the centre of the Irish linen manufacture, with a large number of spinning-mills and power-loom weaving factories, which, with

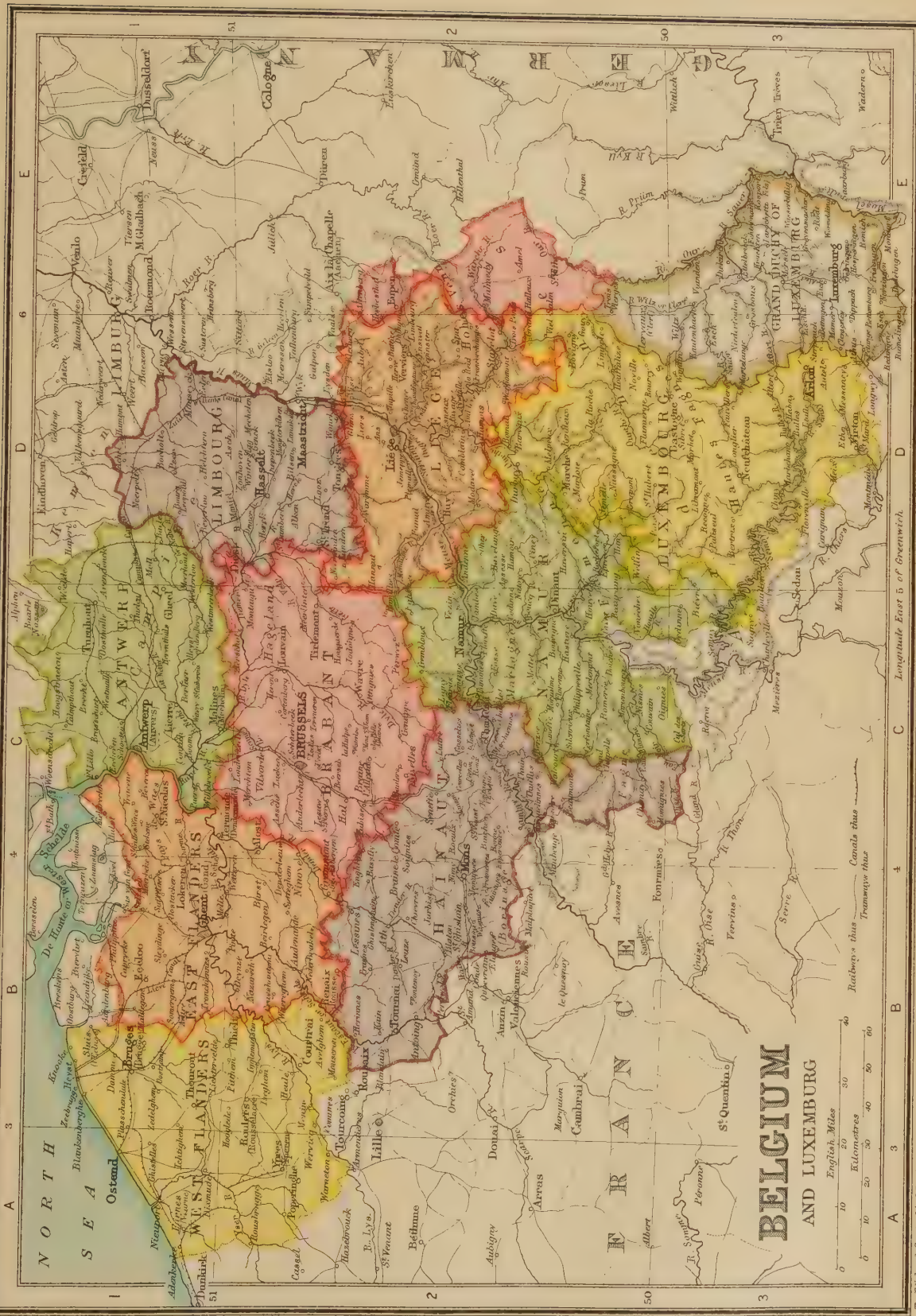
the warerooms, lapping-rooms, &c., are the chief source of employment in the city. Shipbuilding and marine engineering is one of the most flourishing industries, the two principal firms being Harland and Wolff and Workman, Clark, & Co.; the number of hands at Harland & Wolff's alone exceeds 20,000. Many of the finest vessels afloat have been built by Harland & Wolff, notably the White Star Liners *Oceanic* (17,274 tons), *Celtic* (20,904 tons), *Cedric* (21,035 tons), *Baltic* (23,876 tons), *Adriatic* (24,541 tons), and *Olympic* and the ill-fated *Titanic* (each 45,000 tons), these two being when launched the largest vessels in the world. Other industries are distilling, pork-curing, flour-milling; the manufacture of aerated waters, felt, artificial manures, ropes and cordage, machines, tobacco; and letter-press and lithographic printing. The chief exports are pigs, iron ore, linen, sheep, whisky, and potatoes. Here opposition to Home Rule has always centred. At intervals, as in August 1907, there have been serious riots between the lowest classes of the Protestant and Catholic population, which in and after 1920 developed into a continued terror. The city till 1918 sent four members to the House of Commons; its representation was then increased to nine, and a member was given to the university. In the parliament of Northern Ireland Belfast city has sixteen members and the university four. The Lord Mayor is *ex officio* a member of the senate. Stormont Castle, to the east of Belfast, was bought in 1921 to house the Northern parliament, ministries, and courts of justice. Lord Kelvin was a native, as were his brother James Thomson, Thomas Andrews, Sir J. Emerson Tennant, Sir Samuel Ferguson, and Sir John Lavery.

See Benn, *History of Belfast to the End of the 18th Century* (1877); Young, *Historical Notices of Old Belfast* (1896); D. J. Owen, *History of Belfast* (1921); and *The Corporation Year Book*.

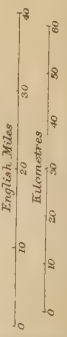
Belfast, a city and port of entry in Maine, U.S., on the west side of Penobscot Bay, with shipbuilding and some manufactures; pop. 5000.

Belfort, a town of France, capital of the remnant left in 1871 of the department of Haut-Rhin, 117 miles ENE. of Dijon by rail. This remnant (235 sq. m.) took from the town its name, *Territoire de Belfort*, and consisted of those portions of Haut-Rhin which, seized by the Germans during the war of 1870-71, were restored to France by the preliminaries of peace arranged at Versailles, 26th February 1871. The strategical importance of Belfort was recognised by France on its cession by Austria in 1648, and it was fortified by Vauban. At the outbreak of the Franco-German war Belfort was a fortress of the first rank; and it maintained, from 3d November 1870 till 16th February 1871, a gallant defence against the Germans. It then capitulated, the defenders marching out with all the honours of war. A memorial of its defence was unveiled in 1884; and the fortifications were thereafter enormously strengthened. Pop. (1872) 8014; (1921) 39,301; of territory (1901) 91,763; (1921) 94,338.

Belfry (old Fr. *berfrei*; modern Fr. *beffroi*, of Teutonic origin, probably from O.H.G. *bergen*, 'to protect,' and *fridu*, 'peace,' hence 'shelter,' and so meaning primarily 'a place of safety'). Originally a kind of movable tower used for attack or defence in sieges, it came to mean a tower to protect watchmen, a watch-tower, beacon-tower, or alarm bell-tower, then any tower where a bell is hung—a bell-tower or turret. The change of *r* to *l* (as in *palfrey*, *pilgrim*, from Lat. *parafredus*, *peregrinus*) probably helped in the change of meaning, through association with *bell*. The belfry usually forms part of a church, but is sometimes detached from it—as at Evesham, Berkeley, and Beccles, in England, and



BELGIUM AND LUXEMBURG



Railways thus
Canals thus
Tramways thus

still more frequently in Italy (see CAMPANILE). Where a church was built in a deep glen, the belfry was occasionally perched on a neighbouring height, as at St Feve and elsewhere in Cornwall, and at Ardelach and Auldbar in Scotland. At this last place, the bell was hung upon a tree, as was common enough in Scotland at the close of the 17th century. Where the belfry consists of a mere



Belfry at Bruges.

turret, it is often called a *bell-gable* or *bell-cote*, and is placed on the west end of the church; a smaller one being usually placed at the east end for the sanctus bell, for which reason it is placed over the altar. Municipal belfries are more common on the Continent than in this country. When the boroughs began to rise into importance after the 12th century, they asserted their right to have bells to call the burghers together for council or for action. Thus detached belfries arose in the heart of towns, and were regarded as important symbols of their freedom. At a later date, they often became part of the *maison de ville*, or town-house, as at Glasgow and Aberdeen, in this country; at St Quentin and Douai, in France; and at Brussels, in Belgium. The belfry attached to the building known as *Les Halles* (not the town-hall) in Bruges, was commenced in 1291. It is 353 feet high, and possesses a carillon of 48 bells, regarded as the finest in Europe. It is well known through Longfellow's poem.

Belgæ, the name given by Cæsar to the warlike tribes which in his time occupied that one of the great divisions of Gallia bounded on the N. by the Rhine, on the W. by the ocean, on the S. by the Sequana (Seine) and Matrona (Marne), and on the E. by the territory of the Treviri. Their country was level, containing no mountains of any height, except the Vosges in the south. The name seems to have originally designated several powerful tribes inhabiting the basin of the Seine, and to have been afterwards used by Cæsar as a general appellation for all the peoples north of that river. Most probably they were chiefly of Celtic origin, but within their territories were to be found both pure and mixed Germans.

When South Britain was invaded by Cæsar, he found that Belgæ from the opposite shores of Gaul

had preceded him, and were settled in Kent and Sussex, having driven the aborigines into the interior. The Belgæ in Britain resisted for nearly a century the Roman power, but were finally forced to yield to it. Cæsar regarded them as German, but they rather seem to have belonged to the Celtic portion of the Gallic Belgæ. Certainly none of the names of their three towns are Germanic. See Rhys's *Celtic Britain* (1882), and Elton's *Origins of English History* (1882).

Belgard, a town of Prussia, in the province of Pomerania, on the Persante, 16 miles SSW. of Köslin. It has an old castle, and important cattle and horse markets. There are also an iron-foundry, sawmill, &c. Pop. 10,000.

Belgaum', or **BELGAM**, the chief city of a district of the same name in the presidency of Bombay, situated to the E. of the dividing ridge of the West Ghats, at a height of about 2500 feet above the sea, 55 miles NE. of Goa. Belgaum possesses a fort, which in 1818 was taken from the Peishwa by the British, under whom it has increased in wealth and size. The native town lies between the fort on the east and the military cantonment. The site of the town is well wooded, bamboos, mangoes, tamarinds, and banyans being plentiful. It has a superior institution for the education of native youths. The chief articles of commerce are dry fish, salt, dates, coconuts, coir. Cotton cloth is manufactured here. Belgaum is a seat of the London Missionary Society. Pop. 30,000.

Belgiojoso, a town of Lombardy, North Italy, in a fruitful plain between the Po and the Olona, 9 miles E. of Pavia. Pop. 4000.—The Princess Cristina of Belgiojoso, an Italian authoress and patriot, was the daughter of the Marchese Trivulzio, and was born at Milan, 28th June 1808. In 1824 she married (unhappily) the Prince of Belgiojoso. She was an enthusiastic labourer in the cause of Italian liberty, raised and supported a body of troops in 1849, travelled in the East, and lived many years at Paris. A visionary and a *poseuse*, she was the protectress of Heine, and the friend of Thiers, George Sand, Hugo, Dumas, and Gautier. She wrote on Asia Minor and things Turkish, on Italian politics, and on the house of Savoy, as well as *Souvenirs d'Enfance*, and died 5th June 1871. See *A Revolutionary Princess*, by H. R. Whitehouse (1906).

Belgium (Fr. *Belgique*), one of the smaller European states, consists of the southern portion of the former kingdom of the Netherlands (as created by the Congress of Vienna), lying between France and Holland (i.e. the present kingdom of the Netherlands), the North Sea and Rhenish Prussia. Its greatest length from north-west to south-east is 173 miles; and its greatest breadth from north to south, 105 miles.

Area and Population.—The whole area of Belgium is 11,373 sq. m., or slightly over a third of that of Ireland. The population at the census of 1880 was 5,520,009, and at that of 1910, 7,423,784. Beneath are given the provinces, their areas, their population at December 31, 1910, and their chief towns:

Provinces.	Sq. Miles.	Pop.	Chief Cities.
Antwerp	1,093	968,677	Antwerp.
West Flanders.....	1,249	874,135	Bruges.
East Flanders	1,158	1,120,335	Ghent.
Hainault	1,437	1,232,867	Mons.
Liège	1,117	888,841	Liège.
Brabant	1,268	1,469,677	Brussels.
Limburg	931	275,691	Hasselt.
Luxemburg.....	1,706	231,215	Arlon.
Namur.....	1,414	362,846	Namur.

Total... 11,373 7,423,784

At the same date the kingdom contained twenty-three towns with over 25,000 inhabitants. Of these the largest were Brussels, the capital, 665,806

(including suburbs); Antwerp, 320,640; Liège (or Liége), 174,768; and Ghent, 165,149. The treaty of Versailles added in 1919-20 the German districts of Moresnet, Malmédy, and Eupen, as well as the neutral territory of Moresnet, with an area of 370 sq. m. altogether, and a population estimated in 1920 at 64,500. These additions bring the total population (estimated 1920) to 7,684,272.

The population of Belgium is partly Nordic (blond, long-headed) and partly Alpine (darker, round-headed). The division in physical characters answers generally to the division in language between the Teutonic Flemings (see HOLLAND for language and literature) and the Latin Walloons (q.v.). East and West Flanders, Antwerp, and Limburg are almost wholly Flemish; and Brabant mainly so. The line between the Flemish and Walloon districts runs east and west, a little south of Brussels (which is a French enclave), and is sharply defined, the Flemish part being the richest and most cultivated. The French language has gained the ascendancy in educated society and in commercial life; but Flemish prevails numerically in the proportion of eight to seven. Both are in official use. There is a considerable German-speaking population. See the paragraphs on *Culture* and *Literature* below.

Belgium is the most densely peopled country in Europe, the population being estimated in 1920 at 670 to the sq. m., as compared with 544 in the Netherlands and 649 in England and Wales (1921). In Brabant the density was 1237 per sq. m., in East Flanders 1056. The increase of the population is due largely to the steady excess of births over deaths, which from 1881 to 1885 averaged 57,800 annually, and in 1901 was actually as much as 84,000. This may be compared with the returns from France during the same period, where, with an area seventeen times greater, and a population more than six times as large, the total average excess was only 93,300. In 1910, 3,220,662 spoke Flemish only, 2,833,334 French only (including Walloon), 31,415 German only, 871,288 Flemish and French, 74,993 French and German, 8652 Flemish and German, and 52,547 spoke all three languages. There were, besides, 248,562 foreigners, mainly Dutch, French, and German.

Physical Aspect.—Belgium is, on the whole, a level and even low-lying country, diversified, however, by hilly districts. In the south-east a western branch of the Ardennes highlands separates the basin of the Maas from that of the Moselle, but attains only the moderate elevation of 2000 feet. In the northern portions of Antwerp and Limburg, a naturally unfertile district named the Campine, composed of marshes and barren heaths and irrigated lands, extends along the Dutch frontier. In Flanders the land becomes so low that, in parts where the natural protection afforded by the dunes is deficient, dikes have been raised to check the encroachments of the sea; and the once impassable morasses of the *Morini* and the *Menapii*, which stayed the progress of Cæsar's legions, are now drained and converted into fertile fields surrounded by dense plantations. Colonies having been settled on whatever patches of the sandy, marshy Campine it was deemed possible to reclaim, it has been largely cleared and drained, and become a thriving agricultural and coal-mining district. The coast is said to be undergoing a change by which the land southward is gradually gaining on the sea, while the northern coast is losing.

Hydrography, Climate, Agriculture, &c.—The abundant water-system of Belgium is chiefly supplied by the great navigable rivers Scheldt and Maas, both of which rise in France, and have their embouchures in Holland. The Scheldt, like

the Maas, is navigable all through Belgium. Its tributaries are the Lys, Dender, Durme, and Ruppel. The Maas, or Meuse, receives in its course the waters of the Sambre, the Ourthe, and the Roer. These natural hydrographical advantages are increased by a system of canals. The climate is, in the plains near the sea, cool, humid, and somewhat unhealthy; but in the higher south-east districts hot summers alternate with very cold winters. The mean annual temperature at Brussels is 50° F. The rainfall ranges from 27.5 inches in the west, to 40 inches in the district east of the Maas. The Ardennes districts yield a large supply of wood, and their forests abound in game and other wild animals; while the level provinces raise all kinds of grain—wheat, rye, oats, and barley—potatoes, leguminous plants, hemp, flax, colza, tobacco, hops, dye-plants, and chicory. The beet is cultivated both for sugar and for fodder. About two-thirds of Belgium is in ordinary cultivation, more than one-eighth is meadow and pasture, one-sixth is under wood, and less than 600,000 acres are waste or water. Some hundreds of acres are devoted to vineyards, but the wine produced is of an inferior quality. Good pasturage is found on the slopes and in the valleys of the hilly districts, and in the rich meadows of the low provinces. Gardening occupies a great area; indeed, it has been said that the agriculture of Belgium is gardening on a large scale, so carefully and laboriously is every inch of soil cultivated by the farmers, the vast majority of whom are small holders owning less than one hectare (about 2½ acres) of land. The spade is still the principal instrument used. The interests of agriculture are promoted and superintended by official provincial commissioners, whose delegates, with specialists, form a supreme council. The state supports agricultural schools and experimental stations, and at many middle-class state schools courses of agricultural lectures are delivered to the farmers of the district. Belgium is famous for its horses. In the Campine the care of bees and the cultivation of the silkworm are encouraged, and its butter is considered the best in Belgium. There are valuable fisheries on the coast.

Geology.—The geological formations of Belgium are closely associated with those of France and Britain. The greater portion of the country is covered with Tertiary deposits. A line drawn across the course of the Scheldt, by Mechlin, along the Demer and Maas, will have on its northern and north-western aspect a tract of Tertiary deposits, bounded northwards by the sea. In these Tertiary strata the different geological periods are fully represented; but only the Pliocene is rich in fossils. The Secondary deposits occupy an extensive tract in the centre of Belgium, between the Scheldt and the Demer. The most important district, economically, is the south-western, consisting of Palæozoic rocks—Cambrian, Ordovician, Silurian, Devonian, and Carboniferous.

Mineral Products.—Belgium is rich in minerals, which, next to its abundant agriculture, constitute the chief source of its national prosperity. The four provinces in which they are found are Hainaut, Namur, Liège, and Luxembourg. These yield lead, copper, zinc (calamine), manganese, alum, peat, marble, limestone, granite, slate, iron, and coal. Lead is wrought to some extent in Liège, copper in Hainaut and Liège, manganese in Liège and Namur, black marble at Dinant, slate at Herbeumont, and zinc principally in Liège. But these products are insignificant compared to the superabundance of coal—from anthracite to the richest gas coal—and iron, in which Belgium ranks next to England. Nevertheless large quantities of iron and steel have to be imported to supplement native production. The mines are

superintended, under the minister of industry and labour, by a corps of mining engineers. The coal-mines of Belgium employ some 160,000 persons (110,000 underground).

Manufactures.—The chief manufactures are linen, woollens, cotton, silk, lace, leather, and metals. Flax is one of the most valuable products of Belgium. The great seats of the linen manufacture, the oldest in Belgium, are in Flanders. The lace industry has fallen off in importance, but still employs many thousands of workers. Lace-makers sitting at work at their house doors are a familiar sight in the Flemish towns. Centres of the woollen manufacture are Ghent, Tournai, and especially Verviers. Brussels and Louvain have large carpet manufactures, and Hainault supplies a considerable amount of hosiery. The principal seat of the cotton trade is Ghent, where the industry was first established in 1798. Belgian leather has a good reputation, and the manufacture of gloves has made great progress. Metallurgy also has rapidly increased in productiveness since 1816, when Cockerill (see SERAING) introduced into Belgium the English method of smelting iron with coke. The principal seats of the metal manufacture are Liège, Ghent, Charleroi, Mons, and their neighbourhoods. There are large ordnance-foundries at Liège and Antwerp, and celebrated makers of firearms and machinery in Liège; nail-making at Charleroi; manufactures of copper at Malines, and of tinware at Liège; wire and brass factories at Namur, Liège, and Brussels; zinc manufactures at Liège; and lead and shot factories at Ghent. Gold and silver goods are manufactured at Brussels, Liège, and Antwerp. Diamonds are cut at Antwerp. Besides these, we may mention the straw-bonnet manufacture in the neighbourhood of Liège; the calico-printing at Ghent and Brussels; the paper fabrics of Brussels and Liège; the great glass-works of Charleroi, Liège, and Namur; the porcelain of Tournai; and the sugar-refineries, motor-car works, paper-mills, artificial-silk works, breweries, mostly small, and distilleries.

Commerce.—In the middle of the 13th century Flanders, with Bruges as its chief seat of manufactures, had surpassed all its neighbours in industry. After the discovery of America, Antwerp took the place of Bruges. But the unhappy period of Spanish oppression and the war in the Netherlands deeply depressed Flemish commerce. Separation from Holland has been indirectly favourable to the development of Belgian resources; and an admirable network of railways, including light railways, or 'chemins-de-fer vicinaux,' has greatly promoted commerce. There are over 1200 miles of navigable rivers and canals.

The unit of the Belgian monetary system is the franc, and in 1865 Belgium, along with France, Italy, Switzerland, and Greece, entered on a monetary league, in which these states agreed to adopt the French decimal system of coins, weights, and measures, and established a reciprocity of currency, whereby their respective unit coins would have the same value throughout their territories.

Among the principal articles of export are coal, flax, linen, woollen and cotton goods, glass, chemicals, machinery, sugar, hides, firearms, and nails. About a third of the whole is consigned to France, and most of the remainder to Germany, England, and Holland. The carrying trade is almost entirely in the hands of the British, the native shipping being only some 200 vessels, of under 340,000 tons burden, not including fishing-vessels. In 1919-21 the special exports had an annual value of from £92,000,000 to £348,000,000; the imports, from £210,000,000 to £512,000,000. The commercial intercourse with Great Britain is represented by exports thither to the amount of from £9,000,000

to £44,000,000 a year (woollen yarn, glass and glass-ware, hops, &c.), and by imports from Britain worth from £20,000,000 to £50,000,000 (iron and steel manufactures, cottons, cotton-yarns, oil-seeds, soap, &c.). The exports to Germany (normally) and to France and imports from both countries considerably exceed the British totals; the exports to Germany used to be nearly double.

Religion.—The Roman Catholic is the dominant religion. Although full liberty of worship is guaranteed to all, and the ministers of each denomination are paid by the state, almost the entire population are Roman Catholics, the number of Protestants being set down, when last ascertained (1891), at 27,900, of Jews at 13,200. The supreme Catholic dignitaries of Belgium are the Archbishop of Mechlin and the five diocesan bishops of Bruges, Ghent, Tournai, Namur, and Liège. There are numerous conventual houses and some beguinages. See BEGUINES.

Culture.—Diversity of language has retarded the growth of the national mind and the formation of an independent national literature to act as the bond of national unity. The Flemish element—the most important—has done much of late to foster the Flemish tongue, and if possible secure its predominance. Flemish theatres are supported in the great towns; a Royal Academy to encourage the study of its language and literature was opened at Ghent in 1886; in 1887 the king was constrained to make speeches in Flemish; in 1911 a Flemish university at Ghent was demanded. Official equality with French has been vindicated for Flemish. Against the disruptive tendency of the Dutch and French sympathies of the 'Flamingants' and the 'Fransquillons' the bond of a common religion has hitherto prevailed. Scientific and literary societies, museums, and libraries are numerous. There are many musical schools throughout the country, and great conservatoires at Brussels, Ghent, Liège, and Antwerp. Among the old musicians Jacob Clemens ('Clemens non Papa') and Orlando di Lasso were Flemings; and in later times Grétry, César Franck (a French citizen of German descent), and Ysaye have been natives of Liège, Vieuxtemps of Verviers, and Fétis of Mons. Painting and architecture formerly flourished in the wealthy old towns of Flanders; and although, after the brilliant epoch of Rubens and his pupils, a long period of dullness followed, in modern times a revival of art has taken place, and important academies have been founded at Antwerp and Brussels. For the achievements of the old Flemish school, see PAINTING, and the articles on RUBENS, TENIERS, VAN DYCK, &c.

The Belgian school-system has undergone many changes in modern times. In 1879 education in the public schools was completely secularised; but on the succession of a Catholic ministry in 1884 government support was withdrawn from these schools, and each parish had to decide whether its primary school should be continued at the parish's cost, or the children be sent to the church school. As a result numerous church schools have been recognised as public schools, the others having been abolished. There are state universities at Ghent and Liège, 'free' universities at Louvain (Catholic) and Brussels, 23 *Athénées* and colleges, about 150 middle-class and many private schools, and some Jesuit gymnasia. Yet in 1880 30·3 per cent., in 1900 19·1 per cent., and in 1910 13·1 per cent. of the inhabitants over eight years of age could neither read nor write.

Literature.—The Flemish literature of Belgium falls to be discussed under HOLLAND (*Language and Literature*). Of modern authors in Flemish, Conscience the novelist, Willems the philologist, and the poets Guido Gezelle (1830-99) and Pol de

Mont are noteworthy. Of late, however, the main current of Belgian literary activity has run mainly in the channels of politics and modern national history, and in the French tongue. Historians are Pouillet, Moke, Namèche, Juste, and Kervyn de Lettenhove; Laveleye was a well-known publicist. Quetelet, the statistician and astronomer, was a Belgian. Charles de Coster, author of *La Légende et les Aventures d'Ulenspiegel*; Camille Lemonnier, novelist; Maurice Maeterlinck, poet, playwright, and spiritual philosopher; Émile Verhaeren, poet; Max Elskamp, religious poet; Charles van Lerberghe, poet; Georges Rodenbach, miscellaneous writer; Georges Eekhoud, novelist; Eugène Demolder, tale-writer; and Émile Cammaerts, poet, are amongst the most important recent names in literature. Walloon literature, unlike French literature by Belgians, is of little value in itself. Dating from the end of the 17th century, it consists mainly of popular songs, satirical and humorous, and comedies. Of Walloon writers may be named Nicolas Defrecheux (1825-74), Delchef, and Isidore Dory.

Army.—The Belgian army has a peace-strength of about 50,000 men, raised in time of war to 200,000. It is intended solely for defence, and to preserve the neutrality of the territory; it is recruited partly voluntarily, partly by conscription, to which every healthy man who has passed his nineteenth year is liable. The legal period of service is eight years, but about six of these are, as a rule, passed on furlough. Then follow five years in the reserve. The importance of Belgium in a military point of view, and the length of its frontier towards Holland, Germany, and France, afforded a reason for the maintenance of fortifications at Antwerp, Dendermonde, Namur, Diest, Liège, Mons, Tournai, and Ypres, which the experience of the Great War proved to be helpless against modern artillery. The chief arsenal is at Antwerp.

Government.—The government of Belgium is a limited constitutional and hereditary monarchy, and was established in its present form by the revolution of 1830. The administration of justice is governed by the *Code Napoléon*. The legislative body consists of two chambers—the Senate and the Chamber of Representatives. Representatives are elected by the general body of citizens; senators partly directly by the citizens, partly by the provincial councils according to population, partly by the Senate itself. Certain princes are also senators. In 1919 a few women were allowed to vote, and various inequalities of the suffrage in respect of property, legitimate offspring, &c. were set aside in practice. Constitutional revision in 1920-21 legalised a system which is practically adult male suffrage. The suffrage for provincial and communal councils has also been liberalised.

See FLANDERS, and the articles on the several provinces; also Genonceaux, *La Belgique* (1879); Hymans, *La Belgique Contemporaine* (1880); Wauters, *La Belgique Ancienne et Moderne* (1882 et seq.); Scudamore, *Belgium and the Belgians* (1901); Van de Perre, *The Language Question in Belgium* (1919); Remy de Gourmont, *La Belgique Littéraire* (1915); Jethro Bithell, *Contemporary Belgian Literature* (1915); Albert Heumann, *Le Mouvement Littéraire Belge d'Expression Française* (1913); Maurice Gauchez, *Histoire des Lettres Françaises de Belgique* (1922); Pol de Mont, *Modernités* (a French anthology, 1911); Wilmotte, *Le Wallon* (1893); Defrecheux, &c., *Anthologie des Poètes Wallons* (1895); Hamelius, *Histoire Politique et Littéraire du Mouvement Flamand* (1894). *Onze Dichters*, published in 1880, is an anthology of the poets who, since 1830, had contributed to the revival of Flemish literature.

History.—The history of Belgium dates from 1830-31, when the Southern Netherlands parted from Holland and became an independent kingdom. The narrative prior to 1831 of the provinces forming

the present Belgium will be found in the article HOLLAND. But it may be well to introduce our account of Belgian history with a brief sketch of its previous development. On the downfall of the Roman empire, the *Gallia Belgica* of the Romans passed under the dominion of the Franks. As the feudal system arose, the country was distributed under a number of dukes and counts with a considerable measure of local independence. These provinces were absorbed by the great House of Burgundy from 1385 onwards, and they continued under that rule till the downfall of Charles the Bold in 1477. With his daughter Mary they then passed to the House of Hapsburg, and remained with the Spanish branch of that line till the peace of Utrecht in 1713, being known as the Spanish Netherlands to distinguish them from the northern provinces, which, in the reign of Philip II., had revolted from Spain, and formed a Protestant Republic, while the southern provinces continued subject to the Roman Catholic Church. In 1713, by the peace of Utrecht, the Spanish provinces were transferred from Spain to Austria, as the Austrian Netherlands. The country was conquered by Pichegru in the campaign of 1794, and subsequently united to France by the treaties of Campo-Formio and Lunéville. It now shared the fortunes of France during the Consulate and the Empire, received the *Code Napoléon*, and in all political relations was organised as a part of France. After the fall of Napoleon it was united with Holland under Prince William-Frederick of Nassau, and its boundaries were defined by the Congress of Vienna (May 31, 1815). In the campaign of 1815 Belgium was once again, as it had often been, the 'battle-field of Europe,' and Belgian troops were present at Waterloo.

The union of what had been the Spanish or Austrian Netherlands to Holland in 1815 was from the first an arbitrary one, as the people of the northern and southern parts of the united kingdom differed essentially in religion, language, interests, and historic feeling. Nor was the policy of the Dutch fair or conciliatory. The Dutch almost exclusively occupied the higher posts in the army and administration. The use of French in the southern provinces was discouraged, and the privileges of the Catholic clergy were curtailed. Old feelings of patriotism and the interests of self-government were equally disregarded. Thus, Liberals and Catholics were alike ready to revolt against Dutch supremacy, and the concessions tardily made to satisfy the growing discontent did no good. The outbreak of the French Revolution in 1830 set the example to the discontent across the frontier. On the king's birthday (August 24, 1830), several riots occurred in various towns of Belgium. At this period, however, the idea of separation from Holland does not seem to have presented itself consciously to the Belgian mind; the deputies who were sent to the Hague to state the causes of the general dissatisfaction merely insisted on Belgium's possessing a separate administration, with the redress of particular grievances. But the dilatory and obstructive conduct of the Dutch deputies in the States-general assembled at the Hague on the 13th September, together with the ill-advised occupation of Brussels by an army of 14,000 men, exasperated the Belgian nation beyond measure. A new and more resolute insurrection instantly took place. In seven days the people had deposed the old authorities and appointed a provisional government. Prince Frederick, the son of the Dutch king, who commanded the troops, was compelled to retreat from Brussels to Antwerp, having suffered considerable loss. On the 4th of October Belgium was declared independent by the provisional government. The useless bombard-

ment of Antwerp by the Dutch general Chassé (October 27) increased the bitterness of feeling, and rendered reconciliation wholly impossible. At the national congress of November 10, out of 200 votes only 13 were in favour of republican government. Meanwhile, the London Congress had assembled, and after mature deliberation, the representatives of Austria, Prussia, Russia, and England recognised the severance of the two kingdoms as a *fait accompli* (December 20). When the Belgian Congress met, it appointed Baron Surlat de Chokier provisional regent, but on June 4, 1831, it elected Prince Leopold of Saxe-Coburg king of the Belgians. Leopold entered Brussels on the 21st July, and subscribed the constitution. His marriage to a daughter of Louis-Philippe secured French support. Holland refused to acknowledge the validity of the decision of the London Congress, and declared war, which was speedily terminated by France and England—Holland securing that Belgium should annually pay 8,400,000 florins as interest for its share in the national debt of the Netherlands. And it was agreed by the powers that Belgium should remain an independent and perfectly neutral state. Holland, however, was still dissatisfied, and ventured to employ force. England and France were compelled to interfere. The French besieged and took Antwerp, still held by the Dutch troops; and the blockade of the coast of Holland having brought the Dutch to terms, the dispute was closed by a treaty signed in London, May 21, 1833.

In 1838 it seemed as if Holland and Belgium were likely to engage in war once more. According to the 'twenty-four articles' of the 'Definitive Treaty,' Belgium was under obligation to give up Limburg and a part of Luxemburg during the above-mentioned year. This it now refused to do, and put its army on a war-footing; but its obstinacy finally gave way to the unanimous decision of the five great powers, and on the 19th April 1839 a treaty of peace was signed at London, Belgium's annual share of the Netherlands' debt being at the same time reduced to 5,000,000 florins; and both Limburg and Luxemburg being partitioned between Holland and Belgium.

After 1840 the opposition of the Catholic to the Liberal party became more and more decided, the educational laws not being satisfactory to the clergy, until, in July 1845, the liberal Van de Weyer endeavoured to confirm the so-called 'union' of the two parties. In 1846 a purely Catholic ministry took office; but in 1847 a liberal ministry was formed by Rogier. The revolutionary tempest of 1848 menaced the tranquillity of the country; but the king disarmed hostility by promptly declaring himself ready to retain or to surrender the crown of Belgium, according to the decision of the people.

In July 1848 the elections greatly strengthened the liberal-constitutional party, and in 1850 the educational question was supposed to be settled on soundly liberal principles; but since then there has been a keen and continued struggle between Progressists and Ultramontanes, the balance of power shifting from time to time. Thus liberal ministries were continuously in power from 1857 to 1864, and in 1878 (under Frère-Orban); clerical ministries in 1870, 1876, 1880, and 1884, the educational question being the chief bone of contention. On the death of Leopold I. in 1865, his son had succeeded as Leopold II. In 1861 Belgium took part in the London conference for settling the Luxemburg question, which threatened to plunge Europe in war, but did not sign the guarantee for the neutrality of Luxemburg. On the outbreak of the Franco-German war in 1870, the Belgians, fearing risks both from Prussia and from France, mobilised their army; but in a special treaty

arranged by Britain, both belligerents recognised anew the neutrality of Belgium, guaranteed in 1831 and 1839. In 1885 the Congo Free State was acknowledged by the powers, under the king of Belgium's presidency; its internal management was long the subject of bitter controversy at home and abroad; and in 1907–8 it was annexed to Belgium as Belgian Congo (see CONGO). On the death of Leopold II. in 1909 he was succeeded by his nephew Albert. Political strife about the suffrage led to a revision of the constitution, which in 1900 gave the Catholics a large majority. Since then Socialists and Liberals have secured power by help of proportional representation. A principal sufferer in the Great War (q.v.), Belgium was at once invaded by the Germans, and almost the whole of its territory occupied to the end of the war. The peace added Moresnet, Malmédy, and Eupen to Belgium. Recovery was rapid, but Belgium was involved in the general confusion of Europe. Constitutional revision was undertaken. A military alliance with France, and an aggressive attitude towards Holland and Luxemburg, was the policy of the government till the elections of 1921, when the Socialists went into opposition against a Catholic-Liberal coalition. In 1922 a fifty years' economic union with Luxemburg came into force.

See the histories by Juste (4th ed. 1868), Moke (7th ed. 1881), Hymans (5 vols. 1880), D. Boulger (1913), and Cammaerts (1921).

Belgorod (Russian *Bjelgorod*, 'white town'), a town on the Donetz, 360 miles S. of Moscow, is an archbishop's see, has many churches, manufactures leather, soap, and woollens, and trades in wax, bristles, and hemp; pop. 26,000.

Belgrade (Serb. *Beograd*, 'white town'), an important fortified city, the capital of Serbia and of Yugoslavia, lies opposite Semlin, at the confluence of the Save and Danube. The walls have disappeared since 1862; the last and finest of the five gates was demolished in 1868; the old fortress still crowns the hill. The town has lost its old Turkish aspect, and become quite modern and European. There is a vigorous university. The royal palace, the residence of the metropolitan, the national theatre, the Orthodox cathedral, and the public offices are the principal buildings. Opposite the theatre is a bronze monument (1882) to the murdered Prince Michael III. Belgrade has but trifling manufactures. It is, however, the natural entrepôt of the trade between central Europe and the Balkans. Pop. (1872) 26,674; (1910) 90,890; (1920) 111,740. Belgrade is the *Singidnum* of Ptolemy. Its position made it the chief point of communication between Constantinople and Vienna, and the key to Hungary on the south-east. It has consequently been the scene of many hard-fought contests. The Greeks held it until 1073, when it was captured by the Hungarian king, Salomon. After this it passed through the hands of Greeks, Bulgarians, Bosnians, and Serbians, and these last proprietors sold it in 1426 to the Emperor Sigismund. In 1440 it was unsuccessfully besieged by the Turks, with a large and vain outlay of time and money; and when stormed (1456), was retaken from the Turks by the heroism of Hunyadi and Capistrano. In 1522 it was carried by the Sultan Soliman II. In 1688 it was stormed and taken by Maximilian, Elector of Bavaria; but in 1690 was recaptured by the Turks, when the Christian garrison had been reduced to 500 men. In 1692 Belgrade was vainly besieged by the Duke of Croy; and in 1717 the citadel surrendered to Prince Eugene, after he had defeated an army of 200,000 Turks, with a loss to them of 20,000 men. But in 1739 Belgrade again changed owners, the Turks obtaining it without a shot. In conformity

with the treaty then signed, the fortifications were demolished. In 1789 it was again taken by the Austrians under General Laudon, but by the treaty of peace (1791) was restored to the Turks. From 1806 to 1812 it was in the possession of the insurgent Serbians; and in 1862, after a wanton bombardment from the citadel, it was made the capital of the principality of Serbia, though the citadel remained in the hands of the Turks till 1867. It was taken by the Austrians 2d December 1914, recovered on the 14th, taken again by Austrians and Germans 9th October 1915; and the Serbs re-entered 1st November 1918. It became capital of the new Serb-Croat-Slovene state. The Archbishop of Peć, Belgrade, and Karlovci is Patriarch of the Serbian (Orthodox) Church. The Concordat of 1914 between Serbia and Rome provides for a Roman Catholic Archbishop of Belgrade. See SERBIA, and books there noted.

Be'lial, or, more accurately, *Beli'al*, a Hebrew word, often treated by the translators of the authorised version as a proper name, but really an abstract term meaning 'that which is without use or profit,' 'worthlessness,' hence 'wickedness.' It is mostly used in the forms 'son of Belial,' 'man of Belial,' but the adjunct is often omitted, and the word stands by itself as a term of reproach.

Belief is a term which is sufficiently definite for most ordinary purposes; but it is used with some variety in meaning, and psychologists do not always agree in the tests they give for distinguishing belief from other states of mind. The word is used to mean the acceptance of a proposition, statement, or fact as true on the ground of evidence, authority, or irresistible mental predisposition; the state of trust in and reliance on a person, thing, or principle; as also for the fact believed, and sometimes specifically for the apostles' creed. Belief is by some distinguished from knowledge, inasmuch as the latter rests on evidence, while belief rests on authority. Belief should, some say, not be used of facts such as are occurring in one's own experience, or principles of which the opposite implies absurdity, such as the axioms of geometry. These we *know*; and according to this view, the term should be limited to cases where a proposition is accepted without evidence, or where such evidence as is available implies only probability. On the other hand, the psychologists of what is called the intuitive school are accustomed to regard as beliefs the fundamental data on which reasoning rests; and to say that all knowledge rests ultimately on belief. Belief, they say, may admit of all degrees of confidence, from a slight suspicion to full assurance. There are many operations of mind in which it is an ingredient—consciousness, remembrance, perception. Kant defined *opinion* as a judgment which is insufficiently based, subjectively as well as objectively; *belief*, as subjectively sufficient but objectively inadequate; *knowledge*, as both subjectively and objectively sufficient. The strongest beliefs may of course be false; beliefs in ghosts, astrological prognostications, &c., are usually treated as superstitions. Beliefs as such rest on grounds regarded as sufficient by the person believing, who is prepared to act on his belief; but their grounds may have absolutely no validity for any other person. Such beliefs are nevertheless very real. On the other hand there are many propositions accepted traditionally, and spoken of as beliefs, which are not real vital abiding truths for those who nominally accept them; which have no influence on character or mental tone, and on which those who hold them would not be prepared to act. Faith is a word used in very much the same sense as belief, but specially signifies the acceptance of and reliance on the truths of religion.

For this use, see FAITH, GOD, IMMORTALITY, JUSTIFICATION.

Belisa'rius (Slav. *Beli-tzar*, 'white prince'). This heroic and loyal soldier, to whom the Emperor Justinian was principally indebted for the glory of his reign, was born at Germania, in Illyria, about 505 A.D. Appointed to the command of the eastern army of the empire, stationed on the confines of Persia, he gained in 530 a victory over a Persian army nearly twice as large as his own. In the following year, when the Persians had penetrated into Syria, Belisarius was compelled by the impatience of his troops to offer battle at Callinicum on the Euphrates, and his defeat was followed by his recall. He still remained, however, the firm supporter of his sovereign. In Constantinople, the strife of the two parties, styled the 'Green' and the 'Blue,' had endangered the authority and even the life of Justinian; already a new emperor, Hypatius, had been elected, when Belisarius attacked and slew in the hippodrome 30,000 of the Green or anti-loyalist party, and thus restored tranquillity. Prior to this he had married a wealthy but profligate lady, Antonina, whom he loved with blind uxoriousness.

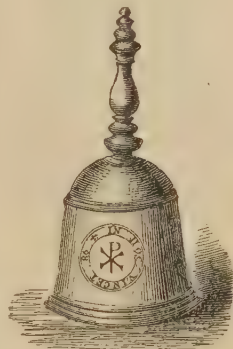
The military career of Belisarius may be divided into two great epochs—the war against the Vandals in Africa, and the war against the Goths in Italy. The first of these epochs was commenced by Justinian sending Belisarius in 533 with an army of 15,000 men into Africa, in order to recover the provinces there held by the Vandal king, Gelimer. After achieving two victories, Belisarius made the king a prisoner, seized his treasures, and conquering Sardinia, Corsica, and the Balearic Isles, brought him to Constantinople, where he appeared in a triumphal procession of the conqueror—the first that a subject had enjoyed since the days of Tiberius. The African Vandals never recovered from this overthrow. Medals were struck in Belisarius's honour; and on the 1st January 535 he was invested with the dignity of 'consul.' The second war was occasioned by Justinian's attempt to wrest Italy from the hands of the barbarians. In 535 Belisarius conquered Sicily; and in the autumn of 536 he occupied Lower Italy. He entered Rome by amicable arrangement with the inhabitants; and finding his forces not strong enough to contend with the Goths in open field, he allowed himself to be besieged for a year, when the siege was raised by the Goths. In 538 Narses had been sent with a reinforcement for the army in Italy; but some misunderstanding occurring between the two generals, they were prevented from relieving Milan, which in 539 was carried and devastated by Braias, nephew of the Gothic king, Vitiges. Consequently, Narses was recalled from Italy; and Belisarius, now placed at the head of both armies, refused to assent to a treaty proposed by Justinian's ambassadors to Vitiges, who had persuaded the Persian king, Chosroes, to invade the eastern Roman territory. Belisarius drove the Goths back to Ravenna, which he captured in 540, along with Vitiges himself. But before he could complete his conquest of the Goths, he was recalled by Justinian to Constantinople. In 541-542 he was engaged in a campaign against the Persians, who had captured Antioch; but was again recalled on account of slanderous representations. His second great struggle with the Ostrogoths now begins. In 544 the barbarians under Totila again invaded and reconquered Italy. Belisarius was sent against them, but with an insufficient army. He, however, maintained his ground for five years, and even succeeded so far as to regain possession of Rome. But in spite of his repeated entreaties, no reinforcements were sent

to him; and in 548 he gave up the command, his rival, Narses, being appointed in his place. In 559, after ten years of retirement, Belisarius once more came forward at the head of an army hastily collected, and overthrew the Bulgarians who were threatening Constantinople. Here this faithful servant, who at Ravenna had refused the crown of Italy offered to him by the Goths, was at length accused of a conspiracy against Justinian, and imprisoned (563); but Justinian, becoming convinced of Belisarius's innocence, restored him after six months to all his honours. He died in 565. Tzetzes, in the 12th century, was the first to aver that, during his half-year's imprisonment, Belisarius suspended a bag from the window of his cell, and exclaimed to those who passed by: 'Give an obolus to Belisarius, who rose by merit, and was cast down by envy!' Lord Mahon, in his *Life of Belisarius* (Lond. 1829), endeavours, but without success, to confirm the tradition of Belisarius being deprived of sight and reduced to mendicancy—a fiction given in Marmontel's romance, which supplied the painter Gérard with the subject for a fine picture. See Hodgkin's *Italy and her Invaders* (1880-85).

Belize, or **BRITISH HONDURAS**, a British colony washed on the E. by the Bay of Honduras, in the Caribbean Sea, and elsewhere surrounded by Guatemala and Mexico. It forms the south-east part of the peninsula of Yucatan, and measuring 180 by 60 miles, has an area of 8600 sq. m. Pop. 45,000. The river Belize traverses the middle of the country, and the Rio Hondo and the Sarstoon form its north-western and its southern boundary. The Cockscorn Mountains (4000 feet) are the highest eminences, the land all along the coast being low and swampy. The country, of tropical fertility, produces mahogany, cedar, logwood, sugar, coffee, cotton, sarsaparilla, bananas and plantains, rubber, coconuts, rum, chicle, cacao, pine-apples, oranges, mangoes, and other fruits. Sponges and tortoise-shell are obtained. The exports are partly the produce of Mexico and Guatemala. The name Belize is probably a Spanish corruption of the name Wallis, one of the early British settlers; otherwise it is usually referred to the Fr. *balise*, 'a beacon.' Those early settlers, buccaniers at starting, then logwood-cutters, were frequently attacked by the Spaniards; but after 1798, when they repulsed a fleet and a land-force of 2000 men, their occupation was formally acquiesced in. Since 1862 Belize has ranked as a British colony, with a lieutenant-governor, whose rank was raised in 1884 to that of governor. Belize, the capital, is a dépôt for British goods for Central America, and has a pop. of about 13,000. See books on British Honduras by Gibbs (1883), and Bristove and Wright (1892).

Bell. Though there has been some variation from time to time in the substance of which bells are formed, yet in all ages the best-approved has been a mixture of copper and tin called bronze. The proportions of the metals are by no means the same in all cases. The small bells found by Layard in the palace of Nimrud contain 10 parts of copper to 1 of tin; but such an excess of the former metal is rare, and 2 to 1 was for ages in Europe a more approximate ratio. For instance, in the reign of Henry III., 1050 lb. of copper and 500 lb. of tin were allowed, together with old bell-metal, for casting three bells for Dover Castle. The tendency of after-ages has been to increase the proportion of copper, which is stated on good authority to be in the ratio of 13 to 4 to the tin. Of late, steel bells have been cast in Sheffield by Riepe's patent, but these have a less sustained vibration, which is also the result of attempting to

extract from a specified amount of bronze a deeper note than it is fairly capable of affording. The fragility of glass bells will prove a serious obstacle to their use, whatever beauty there may be in their sound. As to hand-bells, crotals, and the like, they have been made of almost endless variety of material. Silver, however, is always injurious to the tone of any bell, great or small, and it is only the eye which feels pleasure from these little instruments. An elegant specimen of a silver-gilt hand-bell, which belonged to Mary, Queen of Scots, was exhibited in the year 1887 at Peterborough among a number of other objects connected with that unhappy queen. The pitch of a bell is regulated by the thickness of the striking-place in proportion to the diameter, the ratio being about 1 to 12 in a bell of 10 cwt. Some medieval bells of good tone are remarkable for the thinness of the sound-bow.



Queen Mary's Hand-bell.

From a remote antiquity cymbals and hand-bells were used in religious ceremonies. In Egypt we find that the festivals of Isis were celebrated with the sound of *sistra*, apparently small crotals. Aaron and other Jewish high-priests wore golden bells attached to their vestments; and the priests of Cybele used cymbals in their rites. The Greeks employed bells of some kind (*kōdones*) in camps and garrison; and the Romans announced the hour of bathing by the *æs thermarum*. Great uncertainty prevails as to the introduction of bells into Christian churches. Suetonius relates that Augustus Cæsar placed *tinnabula* round the top of the temple of Jupiter Tonans; and it is possible that when basilicas and other buildings came into the possession of the church in the reign of Constantine the Great, the bells belonging to them were readily adapted to the purpose of calling together congregations. The ascription of the first use of bells for church purposes to Paulinus, Bishop of Nola in Campania, appears to rest mainly on the names *Nola* and *Campana*, which are commonly given to bells. *Nola*, however, is a word in use long before the time of Paulinus, and hardly likely to be taken from the name of a city without modification. The derivations of both words are probably not local. Bells appear to have been introduced into France about 550; and Benedict, abbot of Wearmouth, is related to have brought one from Italy for his church about 680. Bells came into use in the Greek Church in the 9th century, and in Switzerland and Germany in the 11th. Most of the bells first used in Western Christendom seem to have been hand-bells. Several specimens, some of them, it is believed, as old as the 6th century, are still preserved in Ireland, Scotland, and Wales. They are made of thin plates of hammered iron, bent into a four-sided form, fastened with rivets, and brazed or bronzed. Perhaps the most remarkable is that which is said to have belonged to St Patrick, called the *Clog-an-eadhachta Phatraic*, or 'The bell of Patrick's Will.' It is 6 inches high, 5 inches broad, and 4 inches deep, and is kept in a case or shrine of brass, enriched with gems and with gold and silver filigree, and was made (as an inscription in Irish shows) between the years 1091 and 1105. The bell itself is believed to be mentioned in the *Annals of Ulster* as early as the year 552. Engravings as well of the bell as of its shrine, with a

history of both, by the Rev. Dr Reeves of Lusk, were published at Belfast (where the relic is preserved) in 1850. The accompanying cut shows an ancient specimen of this type from Brittany. Some of the Scottish bells, of the same primitive type, are figured and described in Dr Joseph Anderson's *Scotland in Early Christian Times* (Rhind Lectures, Edin. 1881). The four-sided bell of St Gall, an Irish missionary who died about 646, is still shown in the monastery of the city which bears his name in Switzerland.

Ancient Bell from Brittany.

Church-bells were suspended either in the steeples or church-towers, or in special bell-towers. They were long of comparatively small size: the bell which a king presented to the church of Orleans in the 11th century, and which was remarkable in its age, weighed only 2600 lb. In the 13th century much larger bells began to be cast, but it was not until the 14th century that they reached really considerable dimensions. The bell 'Jacqueline' of Paris, cast in 1400, weighed 15,000 lb.; another Paris bell, cast in 1472, weighed 25,000 lb.; the famous bell of Rouen, cast in 1501, weighed



Great Bell at Moscow (from a Photograph).

36,364 lb. The largest bell in the world is the Great Bell, Monarch or Czar Bell (*Tsar Kolokol*), of Moscow. It is 19 feet high, 60 feet round the rim, and weighs 198 tons. Cast in 1653, it came cracked out of the foundry, and never was hung. In 1837 it was raised on a granite basement, and makes a kind of chapel, the broken side forming the doorway. Another Moscow bell, the largest in use, weighs 128 tons. The Great Bell at Pekin weighs 53½ tons; the 'Kaiserglocke' of Cologne Cathedral (1887; melted 1918), 14½ feet high, 11½ in diameter, made of 22 French cannon, weighed 26 tons 13 cwt.; those of Olmütz, Rouen, and Vienna weigh nearly 18 tons; that first cast for the New Palace at Westminster (but cracked), 14 tons; that of the Roman Catholic cathedral at Montreal (cast 1847), 13½ tons; 'Great Peter,' placed in York Minster 1845,

10½ tons; 'Great Tom' at Christ Church, Oxford, a faulty bell, cast in 1680, 7½ tons; 'Great Tom' at Lincoln, cast in 1834, 5½ tons; the Great Bell at St Paul's, cast in 1881, 17½ tons; the church of the Sacred Heart at Montmartre, close on 19 tons. Many of these weights have been imperfectly verified, and must be received with reserve. See Gatty's *The Bell* (1848), Stainer's *Great Paul* (1882), North's *English Bells and Bell-lore* (1891), Raven's *The Bells of England* (1906), and Walters's *Church Bells of England* (1913).

Associated in various ways with the ancient ritual of the church—inasmuch that Mohammedanism (q.v.) rejects the use of bells and substitutes the muezzin's cry—bells acquired a kind of sacred character. They were consecrated by a complete baptismal service; received names, had sponsors, were sprinkled with water, anointed, and finally covered with the white garment or chrisom, like infants. This usage is as old as the time of Alcuin, and is still practised in Roman Catholic countries. Bells had mostly pious inscriptions, sometimes indicative of the widespread belief in the mysterious virtue of their sound. They were believed to disperse storms and pestilence, drive away enemies, extinguish fire, &c. The medieval inscription, 'Voce mea viva depello cuncta nociva,' is still frequently found on bells in the west of England. Among the superstitious usages recorded to have taken place in old St Paul's Church in London, was the 'ringing the hallowed belle in great tempestes or lightnings.' The strange notion that bells are efficacious in dispelling storms is by no means extinct.

Church-bells were at one time tolled for those passing out of the world, in order that the people might put up their prayers for the dying person, as we learn from the *Rationale* of Durandus. The tolling of the passing-bell was retained at the Reformation; nor do the Puritans seem to have objected to the practice, as, for instance, when Dr John Rainolds was dying, 'he expressed by signes that he would have the passing bell tole for him.' But by the beginning of the 18th century, the passing-bell, in the proper sense of the term, had almost ceased to be heard; the tolling took place after the death, instead of before. The practice of slowly and solemnly tolling church-bells after deaths, and before funerals, is still an established usage throughout England. The *Pardon*, *Gabriel*, or *Ave bell*, prior to the Reformation, was rung at morning, noon, or evening, or before or after service, inviting to the recitation of the salutation of the angel Gabriel, *Ave Maria, gratia plena, Dominus tecum*, for purposes of intercessory prayer, or the forgiveness of personal sins. The *Ave bell* was generally one of the ring dedicated to the angel Gabriel, and bearing on it the words of the Annunciation; but any bell might serve the purpose. The *Sanctus* or *Sacring bell*, rung at the Sanctus in the mass and at the elevation of the host, was often hung in a place by itself, usually on the gable at the east end of the nave; but a small hand-bell is now usual. *Vesper-bell*, properly the bell that summons to Vespers (q.v.), is usually a popular phrase for a bell rung at evening. Bishop Burnet has recorded the order of Bishop Shaxton of Sarum in 1538, concerning the discontinuance of the custom.

The ringing of the *curfew-bell*, supposed to have been introduced into England by William the Conqueror, was a custom of a civil or political nature, and only strictly observed till the end of the reign of William Rufus, the statute being abolished by Henry I. in 1100. Its object was to warn the public to extinguish their fires and lights at eight o'clock in the evening. The eight o'clock ringing is still continued in many parts of England and Scotland.

On all that belongs to the playing of bells in belfries, the inventive genius of the Netherlands long since arrived at proficiency. In some of the church-towers of that country, the striking, chiming, and playing of bells is incessant; the tinkling called chimes usually accompanies the striking of the hours, half-hours, and quarters; while the playing of tunes comes in as a special divertisement. In some instances, these tune-playing bells are sounded by means of a cylinder, on the principle of a barrel-organ; but in others, they are played with keys by a musician. The term *carillon* is used either of the tune played on bells, or of the suite of bells which yields this kind of music. The tower of Les Halles, at Bruges, is allowed to have the finest in Europe (see BELFRY, CAMPANILE).

Many of the church-towers throughout England, in villages as well as in towns, are provided with peals of bells, the ringing of which is a well-known practice. The number of *changes* or permutations of order that can be rung on a peal, is the *factorial* of the number of bells—i.e. the continued product of all the natural numbers from unity to the number of bells. Thus: 3 bells allow 6 changes; 4 bells, 24; 8 bells, 40,320; 12 bells give as many as 479,001,600 changes. The ringing of peals differs entirely from chiming or tolling.

There is no method of sounding bells equal to the English ringing, when the bell at each pull revolves round a complete circle, and is under the full command of the ringer. This power over the bells makes the sequence of sounds to be regulated at the will of the band of performers, each of whom has his bell, while the leader 'calls' the peal. It is of course necessary that strict order should be observed in arranging the changes, for no unassisted memory would carry a ringer far into the peal. Also, from the nature of bell-machinery, a certain time must elapse between two strokes of the same bell, to allow for its swinging round. The first known writer on the subject is Fabian Stedman, a Cambridge printer, whose *Tintinnologia* was published in 1668. He is said to have printed his changes on slips of paper in his leisure hours, and taught them to his company in the tower of St Benedict, Cambridge. According to his account, there was no idea of change-ringing till the beginning of the 17th century, though there certainly seem traces of it in Udall's *Ralph Roister Doister*, which was written in 1553. Once started, the art made rapid progress, and rings of bells increased from five or six to ten and twelve, the latter being the greatest number ever rung in peal. The simplest peals are those called *Grandsire* on an odd number of bells, and *Bob* on an even number. Thus, changes on seven bells, with the tenor, or great bell, sounded last in each change, are called *Grandsire Triples*; on nine, *Grandsire Caters*; and on eleven, *Grandsire Cinques*; while on six, eight, ten, or twelve, the more usual methods are respectively *Bob Minor*, *Bob Major*, *Bob Royal*, and *Bob Maximus*. There are, however, a variety of other methods of producing the changes, known as *Oxford Treble Bob*, *Norwich Court Bob*, &c. The muffled peal, which is an invention of later days, is rung with a leather cap over half of the chapper, thus rendering the chimes alternately clear and dull. The effect is very fine.

The general method of making bells has not varied much for centuries, though constant modifications in detail have come into vogue. A *core* of brickwork covered with soft clay is moulded to the intended form of the inner surface of the bell by means of a curved compass called a *crook*, and in a similar way the form of the outer surface is moulded on the inside of the outer mould, or *cope*. The cope is fitted over the core, with a hole left at the

top for the escape of the air, and the metal in a state of fusion is admitted to fill the space intervening between the cope and the core (see CASTING).

The art of casting bells in sequence of sound appears to have been practised after the Conquest, partly by ecclesiastics, and partly by handicraftsmen, who produced bronze lavers, mortars, and after a time cannons, as well as bells. Walter of Odington, a monk of Evesham, in the time of Henry III., has given careful directions for producing a tunable ring, and Sandre (or Alexander) founder of Gloucester, shortly afterwards, was an ecclesiastic. By the end of the 14th century the work appears to have fallen entirely into the hands of laymen; and excellent bells of the period from that time to the Reformation from the foundries in Norwich, Bury St Edmunds, York, Leicester, and other centres, remain in abundance all over England. Nor has the general form of the bell undergone much change since that time. The late 'Tom of Lincoln,' weighing a ton less than the present bell, was cast in the Minster Yard in 1610 by the joint efforts of Henry Oldfield of Nottingham and William Newcombe of Leicester. The bells made by Miles Graye of Colchester, who died in 1649, are deservedly much esteemed by ringers. Louvain, lately famous under M. Severin van Aerschodt, has produced many excellent bells, great and small, since the days of the Van den Gheyns, nearly four centuries ago. A few medieval bells from Venlo are still found in England. The twelve bells of Christ Church, Oxford, are renowned for their tone; the largest peal in England is that of St Paul's (12 bells, the tenor weighing 64 cwt.).

Rings of bells other than carillons are apparently unknown on the Continent, but in every considerable town fine-toned large bells are to be found, sometimes in sequence though in different churches. Very few old bells remain in France, some districts having been entirely cleared of them in the time of the first Napoleon.

The tubular bells of Harrington of Coventry are steel tubes, varying in length from 4 or 5 to 12 or 14 feet, suspended in a frame in the belfry by means of cords passed through holes in the upper part of each tube, and struck by a hammer above the point of suspension. Since 1896 a revolution has been brought about in the tuning of bells, largely through the efforts of Canon Simpson of Fittleworth, in Sussex; and there is now no reason why every bell should not give out a true and harmonious chord instead of (as frequently) a collection of discords.

Bells have been much used in orchestral music, both singly and in the glockenspiel, a set of bells tuned in scale and played by a keyboard or otherwise. A frame containing a series of metal tubes is now commonly used. In Belgium musicians like M. Josef Denyn of Mechlin perform on the carillon.

The custom of hanging bells on the necks of horses, cows, and other animals, was in use by the Romans, and still survives in Switzerland and elsewhere. The bells are useful in the dark, or when the animals that wear them are out of sight. The attaching of small spherical bells or crotals to riding and sleigh-horses is common in some parts of Europe and America. These crotals used for this purpose are often exactly like those found in British graves, which were suspended on the spear of the warrior.



Ancient Crotal

The *hanging of bells* in dwelling-houses, and ringing them by means of wires from the different apartments, is quite a modern invention; for it was not known in England in the reign of Queen Anne.

More recently, electric bells have been introduced. A galvanic battery requiring attention only at long intervals is used. From this an insulated wire goes to a 'press-button' in a room or elsewhere, thence to the bell, and back to the battery to complete the circuit. The press-button makes contact when one requires to ring; at other times the current is broken. Beside the bell there is an electromagnet, with an arrangement by which a spring is attracted and released in rapid succession as long as the automatically interrupted current of electricity is passing. This spring carries a knob which strikes the bell as it oscillates to and fro. An index is used when the bell is rung by press-buttons from several rooms.

The best-known earlier campanologists are Hieronymus Magius (Girolamo Magi, an Italian jurist), Pacichelli, and Stockfleth. Among later English writers, Lord Grimthorpe (Mr Beckett Denison, Q.C.) approached the subject from the side of acoustics, while Messrs Ellacombe, North, Stahl-schmidt, and others have investigated the archæology of the bells of several districts in England. Schiller's famous *Song of the Bell*, Poe's *Bells*, and Hauptmann's play *Die Versunkene Glocke* may be mentioned as notable amongst poems on the subject.

Bell, book, and candle is a phrase descriptive of certain symbolic ceremonies accompanying Excommunication (q.v.). The book from which the sentence was read was shut, a candle dashed to the ground and extinguished, and a bell rung, with some such words as 'Do to the book, quench the candle, ring the bell.'

To bear the bell—that is, to take the first place—may allude to the bell worn by the leader of a herd or flock, or to a bell given as a prize, or confusedly to both.

'BELLS,' on shipboard, is explained at WATCH. In foggy weather both steamers and sailing-vessels when at anchor sound their bells (see FOG-SIGNALS).

Bell, ACTON. See BRONTË.

Bell, ALEXANDER MELVILLE, was born at Edinburgh in 1819, and there established himself as a teacher of elocution. In 1865 he removed to London, where, two years later, he published his work on *Visible Speech* (q.v.). He had been engaged for more than twenty years in perfecting his phonetic system; and with a view to bring it before the world, he visited the United States in 1868, and delivered a series of lectures, with such success that, in 1870, he removed to America, and finally settled in Washington, where he died 5th August 1905. He there published several books on phonetics; and his *Principles of Phonetics* reached a 5th edition in 1887. Among his earlier writings may be noted an ingenious system of *Steno-Phonography* (1854).—His son, ALEXANDER GRAHAM BELL, the inventor of the telephone, was born at Edinburgh in 1847, and was educated at the High School and University there, at University College, London, and in Germany, obtaining at Würzburg the degree of Ph.D. He removed to Canada and the United States, and at Boston devoted himself to the teaching of deaf-mutes, and to spreading his father's system of 'Visible Speech,' and was professor of vocal physiology. His inventions of the articulating Telephone (q.v.) in 1872-76, of the Photophone (q.v.) in 1880, of the Graphophone (resembling Edison's Phonograph, q.v.) in 1887, and of kindred instruments brought him wealth and fame. He died 2d August 1922.

Bell, ANDREW, D.D., founder of the 'Madras System of Education,' was born at St Andrews, 27th March 1753, and educated at the university of that place. After acting as a tutor in Virginia (1774-81), he took orders in the Church of England, sailed for India in 1787, and within two years was appointed to eight army chaplainships, all of which he managed to hold simultaneously. In 1789 he became superintendent of the Madras Orphanage for the sons of soldiers. Finding it impossible to obtain the services of properly qualified masters, he at length resorted to the expedient of conducting the school by the aid of the scholars themselves. Hence originated the far-famed 'Monitorial System' (q.v.). The state of his health forced him to return to England, where, in 1797, he was pensioned by the East India Company. His pamphlet entitled *An Experiment in Education, made at the Male Asylum of Madras* (1797), attracted little attention, until Joseph Lancaster (1778-1838), a Quaker, commenced to work upon the system, and succeeded in obtaining for it a large measure of public recognition. In 1803 Lancaster also published a tractate on education, recommending the monitorial system, as it was now called, and admitting Bell to be the original inventor of it, an admission which he afterwards discreditably retracted. Lancasterian schools now began to spread over the country. The church grew alarmed, and in 1811 founded the 'National Society for the Education of the Poor,' of which Bell was appointed superintendent, the number of its schools soon increasing to 12,000. He made a journey to the Continent in 1816 to spread his ideas, when he met Pestalozzi. Wordsworth, Coleridge, and Southey, who all had faith in the system, encouraged Bell; but it was found that although powerful service had been rendered to education by its aid, many evils, such as ignorance and inefficiency on the part of teachers, had also resulted from the system. Rector of Swanage till 1809, Bell then was made master of Sherburn Hospital, Durham, and in 1818-19 a prebendary of Hereford and of Westminster. He died at Cheltenham, 27th January 1832. He left (besides a valuable estate) £120,000 for the purpose of founding educational institutions. Half of this was to go to St Andrews, the other half to be equally divided between Edinburgh, Glasgow, Leith, Aberdeen, Inverness, Cupar, and the Royal Naval School, London. See his *Life* by Southey (3 vols. 1844), and Meiklejohn's *An Old Educational Reformer* (1881).

Bell, SIR CHARLES, an eminent surgeon, whose discoveries in the nervous system have given him a European fame, was born at Edinburgh in 1774, the youngest of five sons of William Bell, a clergyman of the Episcopal Church in Scotland. Three of his brothers became professors, the eldest, Robert, filling the chair of Conveyancing in Edinburgh from 1800 to 1816; John and George Joseph are separately treated. While a mere youth, Charles assisted his brother John in his anatomical lectures and demonstrations. In 1799 he was admitted a member of the Edinburgh College of Surgeons; in 1804 he proceeded to London, where for some years he lectured with great success on anatomy and surgery at the academy in Great Windmill Street. In 1807 he made the discovery, which he established by the publication of his *Anatomy of the Brain* (1811), of the existence of sensory and motor nerves in the brain; his investigations were completed between 1821-29, and included researches on the cranial nerves, which are embodied in his *Nervous System* (1830). These discoveries in physiology have been described as the greatest since Harvey demonstrated the circulation of the

blood. Appointed in 1812 surgeon to the Middlesex Hospital, a few years later he became a member of the Royal College of Surgeons, London; in the former institution he delivered clinical lectures, and raised it to the highest repute. To obtain a knowledge of gunshot wounds, he twice relinquished his London engagements—first after the battle of Corunna in 1809, when he visited Haslar Hospital; next after Waterloo, when he repaired to Brussels, and was put in charge of a hospital. In 1824 he was appointed senior professor of Anatomy and Surgery to the Royal College of Surgeons, London, and subsequently a member of the council. On the establishment of the London University, now University College, in 1826, Bell was placed at the head of their new medical school, but soon resigned, and confined himself to his extensive practice, which was chiefly in nervous affections. In 1829 he received the Royal Society's medal for discoveries in science. In 1831 he was knighted on the accession of William IV. In 1836 he was elected professor of Surgery in the university of Edinburgh. He was a Fellow of the Royal Societies of London and Edinburgh, and a member of some other learned bodies. He was editor, jointly with Lord Brougham, of Paley's *Evidences of Natural Religion*. He died suddenly, 28th April 1842, at Hallow Park, Worcester, where he was staying, and was buried in the churchyard there. Of a cheerful disposition, Bell enjoyed literature and music; fishing was a favourite recreation with him. Among his principal works on surgery and the nervous system are: *Anatomy of the Brain*, 12 plates (1802); *Engravings, explaining the Course of the Nerves* (1804); *Anatomy of Expression in Painting* (1806; posthumous edition, enlarged, 1844); *A System of Operative Surgery* (2 vols. 1807-9); *Gunshot Wounds* (1814); *Anatomy and Physiology of the Human Body* (3 vols. 1816); various papers on the nervous system, which originally appeared in the *Philosophical Transactions*; *Nerves of the Human Body* (1824); *Injuries of the Spine and of the Thigh Bone* (1824); *Institutes of Surgery* (1838); *Animal Mechanics*, contributed to the Library for the Diffusion of Useful Knowledge (1828); *Nervous System of the Human Body* (1830, 4to); *Practical Essays* (1841). *The Hand* (1833) is one of the celebrated *Bridgewater Treatises*. See Pichot's *Vie et Travaux de Sir Charles Bell* (1859), and his *Correspondence* (1870).

Bell, CURRER and ELLIS. See BRONTË.

Bell, GEORGE JOSEPH, an eminent lawyer, a brother of Sir Charles, was born at Edinburgh, 26th March 1770, and passed advocate in 1791. Acknowledged one of the greatest masters of commercial jurisprudence of his time, and in particular of that department of it which relates to the laws of bankruptcy, he was in 1822 appointed professor of Scots Law in Edinburgh University, and in 1823 a member of the commission for inquiring into Scottish judicial proceedings. On the report, drawn up by Bell, was founded the Scottish Judicature Act (1825), prepared by him, which effected many important changes in the forms of process in the superior courts of Scotland; the jury court being abolished as a separate judicature, and conjoined with the Court of Session. Appointed in 1832 one of the clerks of the Court of Session, he was in 1833 chairman of the Royal Commission to examine into the state of the law in general. He also prepared a bill for the establishment of a Court of Bankruptcy in Scotland. A Whig in politics, he was intimate with Lord Jeffrey; he was genial and courteous in manner, and possessed considerable culture. He died 23d September 1843. His principal works are: *A Treatise on the Laws of Bankruptcy in Scotland* (1804), and *Commentaries*

on the Laws of Scotland, which soon ranked with Stair's *Institutes* as a standard authority (1810); *Principles of the Law of Scotland* (1829); and *Commentaries on Statutes relative to Mercantile Bankruptcy* (1840).

Bell, HENRY, the father of steam-navigation in Europe, was born at Torphichen Mill, Linlithgow, April 7, 1767. After three years spent as a stone-mason, he was in 1783 apprenticed to his uncle, a millwright. He served under Rennie in London and other engineers, worked in a ship-building yard at Borrowstouness, and in 1790 settled in Glasgow, whence in 1807 he removed to Helensburgh, where his wife kept the principal inn, and he devoted himself to mechanical experiments. As early as 1786 he seems to have conceived the idea of applying steam to navigation; how far he had been anticipated by Fulton and others will be considered under the head of SHIPBUILDING. Anyhow, on 12th January 1812, a small vessel, 40 feet in length, called the *Comet*, built under his directions, and with an engine constructed by himself, was launched on the Clyde with success—the first on European waters. Bell died at Helensburgh, November 14, 1830.

Bell, HENRY GLASSFORD, lawyer and man of letters, was born in Glasgow, 8th November 1803. He attended Edinburgh University, studied law, passed as an advocate in 1832, and gained the acquaintance of the ruling literary spirits of that time in Edinburgh. He was appointed a sheriff-substitute of Lanarkshire in 1839; in 1867 he succeeded Sir Archibald Alison as sheriff, and acquired the reputation of being the best Scottish mercantile lawyer of his day. He founded (1828) and was for three years editor of the *Edinburgh Literary Journal*; besides publishing a vindication of Mary, Queen of Scots (1830); *Summer and Winter Hours* (1831); *My Old Portfolio* (1832); and *Romances and Minor Poems* (1866). He died 7th January 1874. See the Memoir by Stoddart (1892).

Bell, SIR ISAAC LOWTHIAN (1816-1904), was educated at Edinburgh and Paris. After being engaged in extensive chemical works, he founded, with his brothers, the great Clarence iron-smelting works on the Tees. He wrote many papers on metallurgical and chemical subjects; became F.R.S., D.C.L., and an officer of the Legion of Honour; was M.P. for Hartlepool from 1875 till 1880; and was made a baronet in 1885.

Bell, JOHN, of Antermoney, a celebrated Asiatic traveller, born in Campsie parish, Stirlingshire, in 1691, studied for the medical profession. In 1714 he went to St Petersburg, and soon after was appointed physician to an embassy from Russia to Persia. In 1719 he was sent upon another to China, through Siberia, from which he returned in 1821. Next year he accompanied an expedition to Persia, and in 1737 to Constantinople, where he settled for some years as a merchant. About 1746 he returned to Scotland, where he died at Antermoney, July 1, 1780. His *Travels* were published in 1763, and reprinted in Pinkerton's *Voyages and Travels*. Bell is said to have applied to Robertson for help in writing this work, when the latter recommended *Gulliver's Travels* as a model. Hence, perhaps, Bell's simplicity of style, long regarded as a model for travel-writing.

Bell, JOHN, an eminent surgeon, elder brother of Sir Charles, was born in Edinburgh, May 12, 1763. He studied under Black, Cullen, and Monro *secundus*; commenced in 1786 lecturing at Edinburgh on surgery and anatomy; and between 1793 and 1802 published his *Anatomy*. This was followed by a volume of anatomical drawings, illustrative of the structure of the bones, muscles, and joints, and another illustrative of the arteries.

In 1800 he published a *Memorial concerning Military Surgery*; his *System of Anatomy* (1793-95) was translated into German. Of his *Principles of Surgery* (1801-7) a new edition, by his brother, Sir Charles Bell, appeared in 1826. A long and bitter controversy with Dr Gregory as to the attendance of surgeons at the infirmary led to his exclusion from the same. A fall from his horse in 1816, and consequent ill-health, necessitated a visit to the Continent; and he died at Rome, April 15, 1820.

Bell, JOHN, an American statesman, born near Nashville, Tennessee, February 18, 1797, was admitted to the bar in 1816. He was a member of congress from 1827 to 1841, and was made Speaker in 1834, and Secretary of War in 1841. During this period he became, from an ardent Free-trader, a Protectionist and supporter of the Whigs, and favoured the reception of petitions for the abolition of slavery in the district of Columbia; afterwards (1858) he vigorously opposed the admission of Kansas as a slave state. He sat in the United States senate from 1847 to 1859, and in 1860 was nominated for the presidency by the 'Constitutional Union' party, but received only 39 electoral votes, cast by the states of Tennessee, Kentucky, and Virginia. He afterwards took no active share in politics, and died at Cumberland Ironworks, September 10, 1869.

Bell, JOHN, sculptor, was born at Hopton, Suffolk, in 1811, and exhibited at the Royal Academy as early as 1832, but first became well known by his figure of 'Dorothea' (1841). Among his subsequent works have been statues of Lord Falkland (1847) and Sir Robert Walpole (1854), for the new Houses of Parliament, the Guards' Memorial (1858) in Waterloo Place, and the America group in the Hyde Park Albert Memorial (1873), a replica of which, in terra-cotta, is at Washington. To Bell is due the fashion of carved wooden bread-trenchers. He died in March 1895.

Bell, ROBERT, a busy litterateur, born in 1800 at Cork, in 1828 came to London, and till 1841 was editor of the *Atlas* newspaper. He wrote *The History of Russia* and *Lives of the Poets* for Lardner's Cyclopædia, the last volumes of Southey's *Naval History* and Mackintosh's *History of England*, three five-act comedies, two novels, a *Life of Canning*, &c.; but he is best known by his annotated edition of the English poets from Chaucer to Cowper (24 vols. 1824-57). He died 12th April 1867.

Bell, THOMAS, naturalist, was born at Poole, Dorsetshire, in 1792, and in 1813 entered Guy's Hospital, where from 1817 till 1861 he held the post of dental surgeon, whilst also lecturing on comparative anatomy. In 1836 he became professor of Zoology in King's College, London. Elected in 1828 a Fellow of the Royal Society, from 1840 to 1853 he acted as its secretary, and he was also president of the Linnæan Society (1853-61), and first president of the Ray Society (1844). He was author of *British Quadrupeds* (1837; 2d ed. 1874), *British Reptiles* (1839), *British Stalk-eyed Crustacea* (1853), and the article 'Reptiles' in Darwin's *Zoology of the Voyage of the Beagle*. In 1832 he commenced a *Monograph of the Testudinata*, of which only eight parts appeared. The plates were reissued in 1872 with letterpress by Dr Gray. He was associated with Professor Owen in the production of *Fossil Reptilia of London Clay* (1849). His, too, was the classic edition of White's *Selborne* (2 vols. 1878). Retiring from practice in his seventieth year, he had purchased the Wakes of Selborne from the grandnieces of Gilbert White, and there, after enjoying a hale and hearty old age, he died March 13, 1880.

Bella, STEFANO DELLA, born at Florence in 1610, and bred a goldsmith, was enormously impressed by the work of Jacques Callot, and early devoted himself to engraving, showing a like tendency to the *macabre* and grotesque. He spent some years in Paris, and was patronised by Richelieu. In all he executed upwards of 1000 different works—battles, sea-pieces, landscapes, animals, and historical scenes. All are characterised by freedom and delicacy. He died in 1664.

Belladonna, DWALE, or DEADLY NIGHTSHADE (*Atropa belladonna*; *Belladonna*, Ital. 'fair lady,' see below; *atropa*, Gr. *Atropos*, one of the Fates; *dwale*, from A.S., connected with *dull*, from its stupefying effects), a plant of the natural order Solanaceæ (q.v.); a herbaceous perennial, growing up every year as a bush, from 2 to 4 feet high, with ovate entire leaves, and bell-shaped flowers of a lurid purple colour, which are fully larger than those of the common harebell, stalked and solitary in the axils of the leaves. It produces berries of the size of a middle-sized cherry, and which, when ripe, are of a shining black colour, and of a sweetish and not nauseous taste, although the whole plant has a disagreeable heavy smell. It is a native of the southern and middle parts of Europe, and is not uncommon in Britain, in the neighbourhood of towns and of ruins, and flowers from June to November. All parts of the plant are narcotic and poisonous, and fatal consequences not unfrequently follow from the eating of its berries, which have an inviting appearance. Its roots have sometimes been mistaken for parsnips. It owes its poisonous properties to the presence of the alkaloid Atropine (q.v.), which is found in all parts of the plant. Large doses either of belladonna or atropine produce dryness of the mouth and throat, dilatation of the pupils, dimness of vision, bright redness or an



Belladonna (Atropa belladonna):
a, flower; b, fruit.

actual rash on the skin, quickening of the pulse and respiration, talkative delirium, sometimes convulsions; at a later stage complete paralysis, stupor, and death. The treatment in cases of poisoning consists in the prompt use of emetics; and thereafter in the administration of stimulants, especially strong coffee; vegetable astringents, as tannin; and Calabar bean. In medicinal doses belladonna and atropia are used to relieve spasm, as in colic, whooping-cough; to check excessive secretions—e.g. of sweat, milk, saliva; as an antidote in poisoning by opium, Calabar bean, and prussic acid; and for many other purposes. Local application, in the form of liniment, ointment, or plaster, is often more efficacious, especially in the relief of pain, than internal administration. *Belladonna*

has been recommended as a preventive of scarlet fever, apparently on the ground of its tendency, when administered in frequent small doses, to produce an eruption and an affection of the throat somewhat similar to those characteristic of that disease; but the evidence of its utility for this purpose is not sufficient to warrant confidence. But perhaps the most important medicinal use of belladonna, and especially its alkaloid, is in the treatment of diseases of the eye (see EYE, DISEASES OF), in many of which its action is invaluable. Its power of enlarging the pupil and giving a glistening appearance to the eyes, has long been used to enhance the female charms; hence the name. For the Common Nightshade, see NIGHTSHADE; for the Woody Nightshade, see BITTERSWEET.

Belladonna Lily (*Amaryllis belladonna*), a very beautiful and nearly or quite hardy species of *Amaryllis* (q.v.), with rose-coloured drooping flowers pencilled with crimson.

Bellaggio, an Italian village beautifully situated on the promontory that separates the two arms of the Lake of Como.

Bellaire, a city and railway terminus of Belmont county, Ohio, on the Ohio River, 5 miles below Wheeling, with manufactures of glass, nails, iron, and agricultural machines; pop. 15,000.

Bellamy, EDWARD (1850-98), American journalist and author, born at Chicopee Falls, Mass., is best known by his work *Looking Backward, 2000-1887* (1888), which was received as the author's own gospel of socialism. *The Duke of Stockbridge* and two other novels were published after his death.

Bellamy, GEORGE ANNE, an English actress, born most likely at Lisbon in 1727, was the natural daughter of a Quaker school-girl and Lord Tyrawley, by whom she was educated. Having forfeited his favour by going to live with her mother, she secured an engagement at Covent Garden in 1744, and appeared with Quin as Monimia in *The Orphan*. Mrs Bellamy's professional career was brilliant; but her extravagance and profligacy were notorious. In 1785, after many alternations of fortune, a 'free benefit' released her from the debtors' prison, and in the same year she published an 'Apology' for her life (6 vols.). She died in 1788.

Bellamy, JACOBUS, a Dutch poet, born at Flushing in 1757. The son of a Swiss baker, he was indebted for his education to a clergyman and others, who subscribed to send him to the university of Utrecht. He died 10th March 1786, having published three volumes of poetry between 1782 and 1785. Collected editions of his works have appeared at Haarlem in 1826 and 1852, but they omit the finest of all his poems, *Roosje*, a romance remarkable for its pathos.

Bell Animalcules. See VORTICELLA.

Bellarmino, ROBERT, one of the most celebrated Catholic theologians, was born at Montepulciano, near Siena, in 1542. He entered the order of Jesuits at Rome in 1560, and studied theology at Padua and Louvain. Ordained priest in 1569, he was appointed the year after to the chair of theology at Louvain; but he returned to Rome in 1576 to lecture in the Roman College on controversial theology. In 1592 he became rector of the Roman College, was made a cardinal in 1599 against his own inclination, and in 1602 Archbishop of Capua. After the death of Clement VIII., he contrived to escape promotion to the papal chair, but was induced by Pius V. (1605) to hold an important place in the Vatican, where he remained until the time of his death, which took place in the Novitiate-house of the Jesuits,

September 17, 1621. Bellarmine was the chief defender of the church in the 16th century, when its antagonists were mightiest. His ponderous learning, excellent method, and moderation gained him the praise of Bayle, who will not be suspected of any bias in favour of a Jesuit. He gave a conspicuous proof of his fearless honesty in his strenuous opposition to the Pelagian tenets of Molina, a member of his own order. His great work, *Disputationes de Controversiis Christianæ Fidei adversus hujus Temporis Hæreticos* (3 vols. Rome, 1581), is regarded by Catholics as containing the best arguments for their tenets. There can be no question of the merit of his disputations as regards erudition and dialectic dexterity; but as Gerhard, in his *Bellarminian Orthodoxy Testis*, has shown, many of the conclusions are far from being sound or logical. Industry, clearness, and acuteness are the chief merits of Bellarmine's great work; but it is seriously lessened in value by a needless subtlety, forced conclusions, and a very defective exegesis—faults which have long been evident to enlightened Catholic writers themselves. Among his other writings the most able is the *Christianæ Doctrinæ Applicatio*, which was translated into all the European languages. His book, *De Potestate Pontificis in rebus temporalibus*, in which he maintains the supremacy of the pontiff's authority over temporal princes, was condemned as treasonable in Paris and Venice. Pope Urban VIII., at the instigation of the Jesuits, declared Bellarmine to be a 'faithful servant of God'; but his canonisation as a saint has hitherto been opposed. Complete editions of his works have been published at Venice in 1721 (5 vols.), Cologne in 1619 (7 vols.), and Paris in 1874 (12 vols.). His Life was written in Italian by the Jesuit Fuligatti (Rome, 1624); an autobiography reaching down to 1613, written in Latin and hitherto withheld by the Jesuits, was edited in 1887, with a German translation, by Döllinger and Reusch. This interesting book somewhat belittles the man, if not the controversialist and theologian. There is also a Life by Couderc (Paris, 1893).

Bellary, the chief town of Bellary district, 305 miles NW. of Madras by rail. One of the principal military stations in the presidency of Madras, it is strongly defended by two lines of fortifications. The upper fort, crowning a rock 2 miles in circuit, and 450 feet high, is supplied with water from tanks excavated in the solid granite. Besides the fort and adjacent cantonments, Bellary comprises a native town to the southward, with fine military bazaars. On the north are the public offices, churches, dispensary, school, and railway station. The heat is great, but the town is considered healthy. The cotton traffic and trade of the town has been stimulated by railway connection. Pop. (1911) 58,247.—The district, lying between the Nizam's territories and Mysore, has an area of 5904 sq. m.; the population, which declined in 1871-81 owing to the famine of 1876-78, was at the census of 1911 over 1,000,000. Elevated on the east slope of the West Ghats, Bellary has an extremely dry climate. Iron, copper, lead, antimony, manganese, and alum are found; salt and saltpetre are extracted from the soil. Cotton, oil-seeds, hemp, sugar-cane, are the chief products; there are manufactures of cotton and woollen goods, and salt, chintz-stamping, and iron-smelting.

Bellay, JOACHIM DU, a distinguished French poet and prose-writer, the date of whose birth was probably 1522, though an attempt has been made to prove that it happened in 1525, 'as a compensation from nature to France for the battle of Pavia.' He was, next to Ronsard, the most important member

of the famous group of writers known as the Pléiade, through whom the enthusiasm and culture of the Renaissance were turned into the channel of French poetry. His *Défence et Illustration de la Langue Française* (1549), in which the aims of the Pléiade were explained and vindicated, marks an epoch in French literature. In this work Du Bellay maintained that French prose should be modelled as closely as might be on the Greek and Latin masterpieces; that the earlier French poetry should be set aside as trivial and shapeless; that French verse-writers should thenceforth seek to reproduce the classic stateliness of rhythm and diction in new metrical forms, such as the ode and the sonnet, adopted from their Latin and Italian predecessors. The book contributed greatly to the success of the literary revolution which was effected by the Pléiade (q.v.). In 1549 Du Bellay published a collection of sonnets which led to a brief quarrel with Ronsard on the question of priority in a new field of poetry. He was in Rome (1553-57) as secretary to his relative, the Cardinal du Bellay; but a diplomatic career proved to be uncongenial to him, and he had lost the cardinal's favour and fallen into difficulties before his death in 1560. His poems—nearly all translations—include a series of sonnets addressed to one Mademoiselle de Viole: *Regrets*, *Jeux Rustiques*, and *Les Antiquités de Rome*, translated by Spenser under the title of the *Ruins of Rome*. His verses give singularly graceful expression to the mood, at once pensive and pleasure-loving, which is a characteristic of most writers of the French Renaissance. A few of his poems—among them his best-known piece, the charming *Vanneur*—were admirably translated by Andrew Lang. See Marty-Laveaux's edition (1866-67), and Chamard's (1908); Life by Chamard (1900); and Pater's *Studies in the Renaissance*.

Bell-bird (*Chasmarchynchus*), one of the chattering (Cotingidae), found in some of the warm parts of South America, remarkable for the metallic resonance of its cry, which resembles the tolling of a bell, with pauses varying from a minute to several minutes. It is about the size of a jay; the beak is very broad, flat, and wide in its gape; the neck and cheeks are naked. The male is of snow-white plumage, and from his forehead rises a spiral tubular appendage nearly five inches in length when fully extended. It is not the case that the wattle, or caruncle, can be erected or inflated. When extended it droops over the bill; otherwise it lies along the bill, and shrinks to half an inch in length. It becomes elongated when the bird is about to utter its characteristic note. The exact anatomical relations of the excrescence, which consists of fine elastic tissues, are not known. The bird generally takes his place on the top of a lofty tree, and his tolling, heard a distance of three miles, resounds through the forest, not only at morning and evening, but even at midday. The female is smaller, and brightly coloured. Four species are known. In Australia and New Zealand two or more species of honey-suckers are called Bell-bird.

Belle-Alliance, the name given by the Prussians to the battle of Waterloo (q.v.), from a farm occupied by the centre of the French army.

Belle de Nuit (Fr., 'beauty of the night'), a name sometimes given to the Marvel of Peru (*Mirabilis jalapa*), sometimes also to certain tropical American and West Indian species of Convolvulaceæ, with extremely beautiful and fragrant flowers, which open only during the night.

Belleek, a village of Ireland, in the County Fermanagh, on the river Erne, below Lough Erne, is famous for the fine porcelain with pearly iridescent glaze (Belleek ware), and pottery manufactures from its own clay.

Belle Isle, a rocky island in the Atlantic, about midway between the NW. of Newfoundland and the eastern point of Labrador. About 21 miles in circumference, it is chiefly known as giving name to the adjacent strait on the south-west, which, with a length of 70 miles and a greatest breadth of 11 miles, separates Labrador from Newfoundland, and forms the most northerly of the three channels between the Gulf of St Lawrence and the open ocean.—Another Belle Isle (South) lies E. of the N. projection of Newfoundland; and a third in the Bay of Conception, Newfoundland.

Belleisle, CHARLES LOUIS AUGUSTE FOUQUET, DUC DE, marshal of France, born in 1684 at Villefranche, in Aveyron, was the grandson of the intendant Fouquet. He early distinguished himself in the wars in Italy and the Low Countries against Spain, and afterwards in Poland. In the war of the Austrian succession, he stormed Prague in 1741, and in the following year conducted the marvellously skilful retreat to Eger. In 1757 he was made war minister, and as such introduced important improvements in the French service, reforming the promotion and camp-discipline, and increasing the military schools. He died January 26, 1761, the last of his house.

Belleisle. See FOUQUET (NICOLAS).

Belleisle-en-Mer, a French island in the Atlantic, 8 miles S. of Quiberon Point, in the department of Morbihan, measures 11 miles by 7, and has an area of 330 sq. m. The inhabitants are chiefly engaged in fishing. Salt is made along the shores, and good pastures are found in the interior. The chief town is Le Palais, a seaport and fortified place. In the 16th century, the monks of Quimperlé ceded it to Charles IX., who gave it to the Marshal de Retz, that he might fortify it. His successor sold the island in 1658 to Fouquet, intendant of finance, who further improved and strengthened it. His grandson, the celebrated Marshal Belleisle, ceded the island to Louis XV. in exchange for the Comté Gisors (1718). It was captured in 1761 by the English fleet under Keppel, but restored in 1763.

Bellenden (BALLANTYNE), JOHN, of Moray, a Scottish writer in the reigns of James V. and Queen Mary, was born towards the close of the 15th century, and in 1508 matriculated at St Andrews as 'of the Lothian nation.' He completed his education at Paris, where he took the degree of D.D. at the Sorbonne. Bellenden is best remembered by his translation of Boece's *Historia gentis Scotorum*, and of the first five books of Livy (both done in 1533), interesting as specimens of the Scottish prose of that period, and remarkable for the ease and vigour of their style. To each of these works are prefixed metrical *prohemes* or prologues. Bellenden's *Croniklis of Scotland* professes to be a translation of Boece, but it is a very free one, and contains numerous passages not to be found in the original, so that it is in some respects to be considered almost an original work. The author enjoyed great favour for a long time at the court of James, at whose request he executed the translations. As the reward of his performances, he received grants of considerable value from the treasury, and afterwards was made archdeacon of Moray and canon of Ross. Becoming involved, however, in ecclesiastical controversy, he left his country, and, according to Bale and Dempster, went to Rome, where he died about 1550, or as late as 1587. The Livy was first published in 1822 by Thomas Maitland (Lord Dundrennan), uniform with his edition of the *Croniklis* (1821); and by W. A. Craigie (S.T.S. 1901-3).

Bellenden, WILLIAM, a Scottish author, who was born, it would seem, at Lasswade, about 1555,

and who died about 1633. Most likely a Catholic, he was a professor in the university, and an advocate in the parliament, of Paris, and was employed there in a diplomatic capacity by James VI., who about 1610 conferred on him the appointment of Master of Requests (*magister libellorum supplicum*). His *Ciceronis Princeps* (1608), *Ciceronis Consul, Senator, Populusque Romanus* (1612), and *De Statu Prisci Orbis* (1615), he republished in 1616 under the title *De Statu Libri tres*. His crowning labour was *De Tribus Luminibus Romanorum* (1634), the 'three luminaries' being Cicero, Seneca, and Pliny, out of whose works he intended to compile, on the same plan as his previous works, a comprehensive digest of the civil and religious history, and the moral and physical science, of the Romans. 'Bellenden,' says Hallam, 'seems to have taken a more comprehensive view of history, and to have reflected more philosophically on it, than perhaps any one had done before.' His works furnished the materials for Middleton's *Life of Cicero*. Warton first denounced the theft, which was afterwards made clear by Dr Parr in his edition of the *De Statu* (1787).

Bellerophon (originally called HIPPOCAMPUS) was the son of the Corinthian king Glaucus, and Eurymede, daughter of Sisyphus. Other accounts make Neptune his father. Having accidentally killed the Corinthian Bellerus, he fled to his relative Proetus, king of Argos, whose wife, Antea, fell in love with the young hero. He rejected her offers, whereupon in revenge she poisoned her husband's mind against his guest. Proetus sent him to his father-in-law, Iobates, king of Lycia, with a sealed message, asking Iobates to cause the youth to be slain. The latter, reluctant to do so directly, imposed upon Bellerophon the seemingly impossible task of slaying the formidable Chimæra (q.v.). Mounted on the winged steed Pegasus (given to him by Pallas), the hero ascended into the air, and succeeded in slaying the monster with his arrows. He was next sent against the Amazons, whom he also defeated. On his way home he destroyed an ambuscade of Lycians, set by Iobates for his destruction. That monarch now thought it useless to attempt his death, and, as a sort of recompense, gave the hero in marriage his daughter Philonoe, by whom he had three children—Isander, Hippolochus, and Laodameia. Homer relates that he at last drew on himself the hatred of the gods, and wandered lonely through the Aleian field. Pindar relates that Bellerophon on Pegasus endeavoured to mount to Olympus, when the steed, maddened by Jove through the agency of a gadfly, threw his rider, who was stricken with blindness. Bellerophon was a favourite subject in ancient art. His story was dramatised by Sophocles in *Iobates*, and by Euripides in *Sthenobea* and *Bellerophontes*, but not one of the three has come down to us.

Bellerophon, an extinct genus of molluscs, known as an abundant fossil. The shell is spirally coiled in one plane, and the outer margin has a deep notch. About 300 species are known, persisting from the Cambrian to the Carboniferous



Bellerophon tangentialis.

strata. Bellerophon has been bandied about from one division of molluscs to another. Montfort, who established the genus, placed it among cepha-

lopods; till lately it was regarded as a heteropod; now it is placed among fissionbranch gasteropods, not far from the common ear-shell, and nearer the family Pleurotomariidae.

Belles-lettres, a term adopted from the French into the English and various other languages. It is commonly used in a somewhat general sense to designate the more elegant or refined departments of literature. In English usage it is synonymous with another vague expression, *polite literature*, including history, poetry and the drama, fiction, essays, and criticism.

Belleville, an eastern suburb or outlying section of Paris, was enclosed by the line of fortifications. It is largely inhabited by the poorest class of workmen, and is notable as a centre of Communistic agitation.

Belleville, a thriving city in the province of Ontario, Canada, situated on the Bay of Quinte, Lake Ontario, 48 miles W. of Kingston by rail. It is the seat of Albert University (1857). Pop. 12,000.

Belleville, a city of Illinois, U.S.A., situated in a productive region, 16 miles SE. of St Louis, with coal-beds in the vicinity, and manufactures of iron goods, thrashing-machines, glass, shoes, beer, flour; pop. 25,000, largely German.

Belley, a town in the French department of Ain, 40 miles E. of Lyons. It has a cathedral dating from 889, and fine lithographing stones are procured in the neighbourhood. Pop. 7000.

Belligerent. See ENEMY, NEUTRALITY.

Bellingham, a city and seaport of Whatcom county, Washington, has timber and salmon-canning industries; pop. 26,000.

Bellingham. See PERCEVAL.

Belli'ni, the name of a Venetian family which produced several remarkable painters. The earliest was JACOPO BELLINI, who died in 1470. He was a pupil of the celebrated Gentile da Fabriano, and was the first to bring to Venice the skill of Florence. Most of his pictures have perished.—His elder son, GENTILE BELLINI (born probably in 1424; died 1507), was distinguished as a portrait-painter, and also for his processional groups, with fine architectural perspective. Along with his brother, he was commissioned to decorate the council-chamber of the Venetian senate. Mohammed II., having by accident seen some of his works, invited Gentile to Constantinople, employed him to execute various historical works, and dismissed him laden with presents. The 'Preaching of St Mark' is his most famous achievement.—His more celebrated brother, GIOVANNI BELLINI (born about 1428; died 1516), was the founder of the older Venetian school of painting, and contributed greatly to its progress. His works are marked at first by a somewhat hard manner and severe drawing, due to the influence of his brother-in-law, Andrea Mantegna, but gradually increase in warmth and tenderness to the very last. His best works are altar-pieces and devotional pictures, and these rank among the noblest products of the religious art of the world. Among his numerous pupils the most distinguished were Giorgione and Titian.

Belli'ni, VINCENZO (1802-35), operatic composer, was born at Catania, in Sicily. An organist's son, he was sent by a Sicilian nobleman to the Conservatorio of Naples, and there was instructed in composition by Tritto and Zingarelli. His opera, *Il Pirata*, immediately carried his name beyond Italy, and for the short remainder of his life fresh operas appeared almost every year, and were received with unstinted applause. Worthy of mention are *I Capuleti ed i Montecchi* (1830); *La Sonnambula* (1831); and *Norma* (1832), his best and most popular work. In 1833 he went to

Paris, where he became acquainted with music other than Italian. He was received with great applause in London, whither he had accompanied the famous Pasta, for whom he had written *La Sonnambula*. After his return to Paris, he wrote *I Puritani* (1834), which shows the influence of the French school, but without servile imitation. Bellini was the most genial and original of all the followers of Rossini. His compositions are entirely devoid of either dramatic vigour or musical depth, but, even in their sometimes monotonous melancholy, display irresistible sweetness. See books by Pougin (1868) and Lloyd (1909).

Bellinzo'na, or BELLENZ, the chief town of the Swiss canton of Ticino, on the left bank of the river Ticino, 109 miles SSE. of Lucerne by rail. It has still its three old castles, which, with their towers and battlements, give the place a medieval appearance. Pop. 10,000, mostly Italian-speaking.

Bellman, KARL MICHAEL (1740-95), 'the Swedish Anacreon,' born at Stockholm, held a series of government sinecure posts there. See SWEDEN (*Literature*).

Bell-metal. See BELL.

Belloc, HILAIRE, born near Paris, 27th July 1870, of French and English parentage, was educated at Edgbaston Oratory School and (after service in the French artillery) at Balliol. Naturalised in 1903, he sat in parliament as a Liberal (1906-10), for South Salford, and became well known as journalist, poet (serious and humorous), essayist, topographer, novelist, satirist, politician, military historian, and Roman Catholic, among other capacities.—His sister MARIE ADELAIDE BELLOC-LOWNDES is a novelist.

Bello Horizonte, capital of the Brazilian state of Minas Geraes, 60 miles NW. of the old capital Ouro Preto, is an attractive modern town, built since 1894; pop. 40,000.

Bello'na, the goddess of war among the Romans, probably a Sabine divinity, was described by the poets as the companion, sister, or wife of Mars, and was represented as armed with a bloody scourge, and as inspiring her votaries with a restless enthusiasm in battle. During the war with the Samnites, 296 B.C., the consul Appius Claudius vowed a temple to Bellona, which was erected afterwards in the Campus Martius. In this temple the senate gave audience to embassies from foreign powers, and also to returning consuls, whose claims to a triumph and entrance into the city would have been nullified. The priests of the goddess were styled *Bellonarii*, and at their mystic festivals, especially on the 'day of blood' (March 20), used to gash their own arms and shoulders, and thus to offer their blood.

Bellet, JOSEPH RENÉ, Arctic explorer, was born in Paris, 18th March 1826. A lieutenant in the French navy, he served with distinction in the French expedition against Tamatave in 1845, and in May 1851 he joined the expedition in search of Sir John Franklin, sent out by Lady Franklin. Distinguished by his noble daring and spirit of enterprise, he took part in several explorations; in one of which he discovered Bellet Strait. He was lost in an ice crack in Inglefield's expedition, 21st August 1853. His *Journal* was edited by Lemer at Paris in 1854 (Eng. trans. 1855).

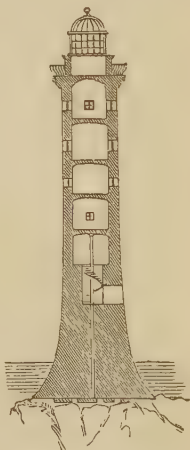
Bellet Strait, the passage on the north coast of North America which separates North Somerset from Boothia Felix, and connects Prince Regent Inlet with Franklin Channel. Its east entrance was discovered in 1852 by Lieutenant Bellet. After four unsuccessful attempts, it was explored for the first time by M'Clintock on his crowning voyage. It is about 20 miles long, and, at its

narrowest part, about 1 mile wide, running pretty nearly on the parallel of 72°, between granite shores which, everywhere high, rise here and there to 1500 or 1600 feet. Through this funnel both the winds and the waters have full play; the latter, permanent currents and flood-tides alike, coming from the west. A point on the south shore, 71° 55' N., 95° W., is the most northerly point of the North American continent.

Bellows. See BLOWING MACHINES.

Belloy, PIERRE LAURENT BUIRETTE DE, one of the first French dramatists who ventured to introduce on the stage native instead of classical heroes. He was born at St Flour, in Auvergne, in 1727, and educated for the law; but the seductions of the stage proved irresistible, and under the name of Dormont he played for some years at St Petersburg and other northern cities. In 1758 he returned to France to superintend the bringing out of his tragedy *Titus*, trusting that its success would reconcile his family to him. In this, however, he was disappointed, for the piece proved a failure, being only a feeble imitation of Metastasio, and he returned to St Petersburg. In 1762 he again visited France, and obtained a decided success by his tragedy of *Zelmire*. It was followed by *Le Siège de Calais* (1765), *Gaston et Bayard* (1771), and *Pierre le Cruel* (1772). He died at Paris, 5th March 1775. His collected works were edited by Gaillard in 6 vols. in 1779; a selection by Anger in 2 vols. appeared in 1811.

Bell Rock, or INCHCAPE, a reef of old red sandstone rocks in the German Ocean, 12 miles SE. of Arbroath, and nearly opposite the mouth of the Tay. The reef is 2000 feet long; at high water of spring-tides it is covered to a depth of 16 feet, at low water is partly uncovered to a height of 4 feet; and for 100 yards around, the sea is only 3 fathoms deep. It was formerly a fruitful cause of shipwreck, and, according to tradition, the abbot of Aberbrothock (Arbroath) placed a bell on it, 'fixed upon a tree or timber, which rang continually, being moved by the sea, giving notice to the saylers of the danger.' This tradition has been embodied by Southey in his well-known ballad of *The Inchcape Rock*. A lighthouse, 120 feet high, designed by Robert Stevenson and Rennie, was erected in 1807-10, at a cost of £61,331. A new lighthouse was built in 1902.



Section of Bell Rock Lighthouse.

Belluno (the ancient *Bellunum*), a cathedral city of Venetia, Northern Italy, finely situated on the right bank of the Piave, 42 miles N. of Treviso. It is the capital of a province. Pop. 20,000.

Beloit, a city of Wisconsin, U.S.A., on Rock River, 75 miles SW. of Milwaukee by rail. It has a college (1847), several flour and paper mills, foundries, and manufactories of agricultural implements, &c. Pop. 21,000.

Belon, PIERRE, a French naturalist, born in 1518 at Soulletière in Maine, studied medicine at Paris, and in 1546 set out on a journey to Greece, Asia Minor, Egypt, and Arabia. He returned in 1549, and in 1553 published the results of his travels. In April 1564 he was murdered by robbers whilst gathering herbs at a late hour of the evening

in the Bois de Boulogne. Besides his book of travels, Belon wrote several valuable treatises on trees, herbs, birds, and fishes. He was one of the first who established the homologies between the skeletons of different vertebrates; he planted the first cedar in France; and he formed two botanical gardens more than a century before the creation of the Jardin des Plantes. A statue of him was unveiled at Le Mans in October 1887.

Belone. See GAR-PIKE.

Belper, an urban district of Derbyshire, on the Derwent, $7\frac{1}{2}$ miles N. of Derby. It owes its prosperity to the cotton-works of Messrs Strutt, one of whom was in 1856 created Lord Belper. The manufacture of cotton yarn and cotton hosiery is largely carried on; and there are ironworks and engineering-shops. Pop. 12,000.

Belsham, THOMAS, a Unitarian theologian, was born at Bedford, 26th April 1750. The son of a dissenting minister and of a granddaughter of the first Earl of Anglesey, he was educated a Calvinist, and became pastor of an Independent congregation at Worcester in 1778, and head of the theological academy at Daventry in 1781. These offices he resigned in 1789, on embracing Unitarian views, and shortly after received the charge of a new theological academy at Hackney, which collapsed for want of funds in 1796. Before its extinction he succeeded Priestley in his pastoral charge of the Gravel-pit Unitarian Chapel, Hackney, and from 1805 till his death, 11th November 1829, filled the pulpit of Essex Street Chapel. Most of his numerous works are controversial. His doctrine regarding the person of Christ represents the purely 'humanitarian' view, as distinguished from the more nearly Arian sentiments of men like Channing. He published also *Elements of the Philosophy of the Human Mind* (1801); a memoir of his predecessor, Theophilus Lindsey (1812; centenary edition, 1873); *The Improved Version of the New Testament* (1808); and the *Epistles of Paul translated* (4 vols. 1822). See his *Life by Williams* (1833).—His brother, WILLIAM (1752–1827), was an active and voluminous writer of history and political tracts on the side of the Whigs. His principal work, written in a liberal spirit, and in a clear and simple style, was his *History of Great Britain to the Conclusion of the Peace of Amiens* (12 vols. 1806).

Belshazzar, the name of a Babylonian prince mentioned in the book of Daniel as the last Chaldean king of Babylon, slain at the capture of the city by the Medes and Persians. No ancient historian mentions his name as one of the successors of Nebuchadnezzar, but the Babylonian cuneiform inscriptions give the name Bel-sar-uzar as that of the son of Nabonidus, the last king of Babylon (555–538 B.C.), and one of his later inscriptions gives ground for the inference that the son was associated with his father on the throne. According to the book of Daniel he had a divine intimation of his impending fate in the words written by an invisible hand upon the wall, *Mene, Mene, Tekel, Upharsin* (lit. 'numbered, numbered, weighed, and divisions').

Belt, the name given to two straits, the GREAT and the LITTLE BELT, which, with the Sound, connect the Baltic with the Cattegat. The GREAT BELT, nearly 40 miles in length, and varying in breadth from about 10 to nearly 20 miles, divides the Danish islands, Zealand and Laaland, from Fünen and Langeland. The LITTLE BELT divides the island of Fünen from Jutland. It is equal in length to the Great Belt, but much narrower. Its greatest breadth is about 10 miles, but it gradually narrows towards the north, until at the fort of Fredericia it is less than a mile wide; thus the

passage from the Cattegat into the Baltic is here easily commanded. Both the Belts are dangerous to navigation on account of numerous sand-banks and strong currents; and therefore, for large vessels, the passage by the Sound (q.v.) is preferred.

Bel'tane, BELTEIN, or BEALTAINN, the name of a heathen festival once common to all the Celtic nations, and traces of which have survived to the present day. The name is derived from *tin* or *teine*, fire, and *beal*; *Beil* is understood to be the name of a god not directly connected with the Asiatic Belus, but a deity of light peculiar to the Celts, appearing as Belinus in Ausonius, Tertullian, and numerous inscriptions. The great festival of this worship among the Celtic nations was held in the beginning of May, but there seems to have been a somewhat similar observance in the beginning of November—the beginning and the end of summer. On such occasions, all the fires in the district were extinguished; the *needfire* was then kindled with great solemnity, and from this sacrificial fire the domestic hearths were rekindled.

The earliest mention of the beltane is found in Cormac, Archbishop of Cashel in the beginning of the 10th century. Two fires were lighted side by side, and to pass unhurt between them was wholesome for men and cattle. Traces of this usage existed in the Scottish Highlands even in the 19th century, and it is more than probable that the leaping through the flames which was then practised was a survival of a time when sacrifices of animals and even of human beings were thus offered. At Carnac, in Brittany, and in the Irish South Isles of Aran to the present day, the domestic animals are driven through the flames, and thus obtain immunity from accident and disease throughout the year.

Some scholars have striven to identify the worship of the Celtic Beal with that of the Baal or Bel of the Phenicians and other Semitic nations. It is unnecessary, however, to go beyond the family of nations to which the Celts belong in order to find analogies either for the name or the thing. Grimm identifies the Celtic Beal not only with the Slavonic *Belbog* or *Bjelbog* (*bel* or *bjel*, 'white,' *bog*, 'a god'), but also with the Scandinavian and Teutonic Balder or Paltar, whose name appears under the form of *Baldag* ('the white or bright day'), and who appears to have been also extensively worshipped under the name of *Phol* or *Pol*. The universality all over Europe in heathen times of the worship of these personifications of the sun and of light through the kindling of fires and other rites, still finds a survival in the periodical lighting of *bonfires*. The more marked turning-points of the seasons would naturally determine the times of these festivals. The two solstices at midwinter and midsummer, and the beginning and end of summer, would be among the chief seasons. The periods of observance, which varied, no doubt, originally, more or less in different places, were still further disturbed by the introduction of Christianity. Unable to extirpate these rites, the church sought to Christianise them by associating them with rites of her own, and for this purpose either appointed a church-festival at the time of the heathen one, or endeavoured to shift the time of the heathen observance to that of an already fixed church-festival. All over the south of Germany, the great bonfire celebration was held at midsummer (*Johannisfeuer*), a relic, probably, of the sun-festival of the summer solstice: throughout the north of Germany, it was held at Easter. It is probable that this fire-festival (*Osterfeuer*) of Ostara—a principal goddess (Eastre) of the English—had been originally held on the 1st of

May, and was shifted so as to coincide with the church-festival now known as Easter.

In Great Britain, St John's Eve was celebrated with bonfires; and Easter had its fire-rites, which, although incorporated in the service of the Roman Catholic Church, were clearly of heathen origin. But the great day for bonfires in the British Islands was the 1st of November. Fewer traces of this are found in other countries, and therefore we must look upon it as more peculiarly Celtic.

Belts and Belting. The term belt is employed to indicate the flexible connecting piece which, by means of its frictional resistance to slipping, enables a revolving pulley to give a rotational motion to another pulley. These flexible belts are usually made from leather, which has been tanned by oak bark, or some other suitable bark such as that of American hemlock spruce, wattle, &c. Pure vulcanised india-rubber, or india-rubber with interposed plies of canvas, and waterproofed woven cotton belts are also largely used, especially in situations where leather belting would be unsuitable; in fact, most of the well-known textile fibres have been employed to manufacture belting. In general, belts are flat strips running on pulleys with flat or slightly rounded rims; sometimes grooves are formed in the pulley-rims, and then the belts are circular in cross-section, or else ordinary hemp or wire ropes are employed. The belt is made into an endless band by means of a laced joint, or by the use of special metal fasteners, usually so made that the joint may be easily broken when it is necessary to tighten the belt at any time. If the endless band is used as an open belt, the two pulleys will rotate in the same direction; whereas if the band is used as a crossed belt, the two pulleys will revolve in opposite directions.

The most essential qualities in a belt are (1) good grip of the surface of the pulley-rim; (2) strength to resist the tension in the belt, which is requisite in order to transmit power from one pulley to the other; (3) non-liability to stretch; (4) durability. The coefficient of friction for leather belting running on iron pulleys when the belting is new varies from 0.3 to 0.4, but when the belt has been in use for some time, and has become a little greasy, the coefficient has a lower value. If the belt is in contact with one-half the circumference of the pulley, then the ratio of the tension in the belt on the tight or driving side to that on the slack side for a coefficient of friction 0.22 is very nearly 2, and for a coefficient of friction equal to 0.3 it is $2\frac{1}{2}$.

The working tension for ordinary leather belting should not exceed 330 lb. per square inch of section; the thickness of single belting varies from $\frac{3}{8}$ to $\frac{7}{16}$ inch; hence the working tension in such belts should not exceed about 65 lb. per inch width of belt. In order to prevent excessive wear from the belt slipping on the pulley-rim, the smallest pulley diameter should not be less than about thirty-five times the thickness of the belt, which means a 7-inch pulley for a single belt, and about 21 inches diameter for a treble belt. In ordinary working the total slip should not exceed about 2 per cent. of the belt velocity; when the slipping becomes excessive, the belt is liable to be thrown off the pulley. When belts are driven at speeds of less than 2000 feet per minute, the effect of centrifugal force is negligible; but when speeds are increased to 6000 or 7000 feet per minute, centrifugal force becomes an important factor, and must be taken into account in calculating the amount of power a belt will transmit.

Cotton belting is cheaper and stronger than leather belting, and can be obtained in widths varying from $1\frac{1}{2}$ inch to 60 inches, and with

varying numbers of plies. The strength of 8-ply is said to be over 1100 lb. per inch of width.

Leather chain belting is formed of short pieces or links of leather joined together by metal rivets. This belting is more flexible than ordinary leather belting, it can be easily shortened when necessary, and is very suitable for driving dynamos for electric lighting and similar purposes; it can be obtained up to 33 inches in width (see Unwin, *Elements of Machine Design*, part i.; *Trans. Am. Soc. Mech. Eng.*, vii. 347, 540; xv. 204). Flat belting is now extensively used for transporting such materials as grain in flour-mills, &c.

Belu'chistán, or BALUCHISTAN, a country of southern Asia, bounded on the N. by Afghanistan, on the E. by Sind, on the S. by the Arabian Sea, and on the W. by the Persian province of Kerman. It has a coast-line of over 500 miles, and corresponds in general with the ancient Gedrosia, save that the latter extended to the Indus. The area is 135,000 sq. m. The population enumerated in 1921 was 800,678; but in addition there are probably about 1,000,000 nomads. Anciently a part of Persia, it is now a province of the Indian Empire. In bygone ages the Beluchi Desert formed a barrier for the Lower Indus, constraining every assailant from Alexander downwards to prefer the less barren, though perhaps more rugged, route through Afghanistan into the Punjab—a preference strengthened by Alexander's direful experience in returning from the Indus along the coast. Until 1810 Beluchistan was almost entirely a *terra incognita* to Europeans. Most of the country, indeed, is still little known, but railway surveys established its general features. A railway entering from Sind runs by Quetta and by Harnai to the Afghan frontier; and from it a line runs by Nushki into Persia. The surface is generally mountainous, more especially towards the north, where branches of the great Suliman Range, running north and south, rise to a height of 12,000 feet. The ranges in the south generally run east and west, parallel with the coast, and the longitudinal valleys between form the principal thoroughfares, there being no regular routes in the country except those through the Bolan and Mula passes to Quetta and Kelát. Even the bottoms of some of the valleys have an elevation of 5700 feet; and the capital of the chief state, Kelát, or Kalát, on the side of one of them, is 6783 feet above sea-level. Large deserts, rendered impassable in summer by sandstorms, and swept in winter by benumbing, piercing winds, occupy hundreds of square miles of the country; and the rivers—unless after heavy rains, when those in the north-east frequently inundate great tracts of country—are inconsiderable, few of the streams in the south appearing to be perennial at all. The west is largely a land of drought, with stretches of sand varied by bare hills and treeless valleys. The temperature is one of striking and sudden extremes, 125° F. in the shade having been registered on the coast even in March, although at Kelát in February water has been observed to freeze as it was poured on the ground. The pastures, as may be supposed, are poor, so that there are few cattle; sheep, however, as well as mountain goats and antelopes, are numerous. The camel is the ordinary beast of burden; but in the north-west, towards Kerman, serviceable horses, with a marked strain of Arab blood, are bred. The wild animals include the tiger, leopard, wolf, hyæna, ape, wild ass, &c.; and fish in great quantities are caught off the coast. Wherever there is a sufficiency of water the soil is productive—the lowlands yielding rice, sugar, cotton, indigo, and tobacco; and the higher grounds, wheat, barley, madder, maize, and pulse. The mountains are bare at the top, and their slopes are scantily

wooded as a rule; but in the valleys the almond, olive, and peach grow wild, and even the deserts furnish a useful brushwood. The gardens produce excellent fruits of all sorts, and in the sandy coast-district of Mekran, or Makran, the date is carefully cultivated. The minerals are gold, silver, copper, lead, antimony, iron, tin, sulphur, alum, sal-ammoniac, chromite, salt, and petroleum; the manufactures are chiefly carpets, tent-covers of goat's and camel's hair, and rude firearms. The capital of Kelát is Kelát (q.v.), with about 2000 inhabitants, an old citadel, and a number of badly built and very dirty houses. Mastung (population, 5000) is the most thriving township in the state. There are no seaports, the fishing-villages in the south being mere collections of wretched hovels; but along the surf-beaten, sandy cliffs of the coast some sheltered roadsteads are found. The best of these are Sonmiani Bay, Homara, and Gwadar, the last having a fort and a telegraph station. There is an insignificant inland trade, chiefly in the hands of Hindus.

The inhabitants belong to the distinct races of Brahui and Beluchis. The Brahui, who are hospitable and generous, are the aboriginal, dominant, and most numerous race—it has even been proposed to call the country Brahuistan. The Beluchis, praised by some travellers and dispraised by others, are powerful on the borders. Opinions have been widely divided as to the origin of the Brahui, many assuming their kinship with the Dravidians of southern India, although apparently on insufficient grounds. Their language is classed as Dravidian, but appears to contain many ancient Hindu words, and echoes the accent of the Punjab dialect. In appearance they are short, sturdy, and strongly built, with round, flat faces, and brown hair. Their dress is a coarse calico tunic, with trousers fastened at the ankles, and a skull-cap with sash of the same colour. The Beluchis are of Iranian descent, with a mingling of Tatar blood, and their language closely resembles modern Persian; they are both a numerically smaller and a more recent element than the Brahui. They are tall, with longer and more prominent features, and are brave, but restless and prone to predatory warfare, in which they frequently show themselves senselessly cruel. Their dress is distinguished from that of the ruling race by a turban and wider trousers not confined at the ankles. The women's attire is very much the same as the men's. Both races are inured to extremes of heat and cold, and are capable of considerable exertion; but the normal life of the Beluchis, at least, is one of laziness and indulgence, broken only by hunting, racing, and athletic contests. Both are Mohammedans of the Sunni sect, but the teaching of the Koran is confused with numberless superstitious beliefs. Besides these two races, there are colonies of Persian descent called Dehwars, who form a vassal class, Lasis, Khetrans, Jats, indigenous Hindus, servile Ghulams, and Afghans.

The Indian province of Beluchistan includes (1) British Beluchistan (9000 sq. m.), constituted in 1887 out of certain districts (Shorarud, Duki, Sibi, and Shahrig) ceded by Afghanistan in 1879; (2) Agency Territories (including among others Quetta, the Bolan Pass, and tribal areas) leased from the khan of Kelát or otherwise brought under British administration (45,000 sq. m.); (3) the native states of Kelát and Las Bela (80,000 sq. m.). The province is under a high commissioner. The capital is Quetta (q.v.).

Beluchistan is, in a somewhat indefinite manner, under the authority of the khan of Kelát. The khan having acted treacherously towards the British during the Afghan campaign of 1839, his royal city was taken by storm. In 1841 it was

again captured, for temporary occupation, by the British. In 1877 England obtained by treaty with the khan the right of permanently occupying Quetta (which was annexed, with his consent, in 1887), and of having a political agent at Kelát; and the khan practically became a feudatory of the Indian Empire, and placed his territory at the disposal of the British government for all military and strategical purposes, gaining by its moral support a prestige that has made his authority more respected by the semi-independent chiefs of the pastoral tribes. In 1893 the reigning khan was deposed by the British, and his son peacefully proclaimed in his stead. The khan of Kelát rules some 72,000 sq. m., and a population of 470,000; the jam of Las Bela 7100 sq. m., and 61,000.

PERSIAN BELUCHISTAN is that part of south-eastern Persia which adjoins Indian Beluchistan. It is included in the province of Kerman. There are Beluchis not only in India and Persia, but also in Oman.

See Bellow's *From the Indus to the Tigris* (Lond. 1874); works on Beluchistan by Hughes (1877), Macgregor (1882), Floyer (1882), and Oliver (1890); Thornton, *Life of Sandeman* (1895); Holdich, *The Indian Borderland* (1901), and *The Gates of India* (1910); M. L. Dames, *The Baloch Race* (1904), and *Popular Poetry of the Baloches* (1907).

Belu'ga, or WHITE WHALE (*Beluga* or *Delphinapterus leucas*), one of the dolphin family, closely related to the narwhal. The body is from 12 to 16 feet in length, of graceful proportions, and remarkable for its creamy-white colour, and for the absence of a dorsal fin, which is represented only by a slight ridge. The flippers are short; the head is arched, and sinks abruptly to the short rounded snout; the teeth are small and conical, comparatively few in number (8 to 10 on each half-jaw), somewhat distant from one another, absent posteriorly, and often falling out in the adults. It is a markedly gregarious animal, associating in droves of both sexes. The female shows great solicitude for her young. These are at first of a bluish-gray colour. The white whales feed on fishes, which they often follow far up the rivers—e.g. the St Lawrence and the Amur. According to Eschricht, they also eat cuttle-fishes. They are fearless sportive animals, and have been successfully kept in aquaria. Their headquarters are round Greenland, but they occur all over the Arctic seas, often going as far south as the St Lawrence. They only rarely appear on British coasts. The Greenlanders capture them in the fiords by means of strong nets, or by harpooning, though the comparatively soft skin often fails to retain the weapon. The flesh is largely eaten, the fat yields very fine oil, the skin is made into leather, and some of the internal membranes are also utilised. This name is also applied to a great Russian sturgeon (the Bielaga or Huso). See CETACEA, DOLPHIN, NARWHAL, WHALE.

Belur', a village of Mysore, 130 miles W. of Bangalore. Known in the Puráns as *Velapura*, locally regarded as the Southern Benares, it is the site of a celebrated temple.

Belus. See BAAL.

Belvedere (It., lit. 'fine view'), a raised turret or lantern on the top of a house, or a high summer-house in a garden or park, from which to look out on the surrounding country. A part of the Vatican in Rome is known as the Belvedere, and gives its name to the famous statue of Apollo (q.v.). The picture-gallery in the palace at Vienna bears the same name. Others are at Warsaw, Prague, and Weimar.

Belvedere (*Kochia scoparia*), an annual belonging to the Chenopodiaceæ (q.v.), a native of

the middle and south of Europe. It has long been familiar in British gardens as an ornamental annual, not upon account of its flowers—for they have no beauty—but of its close pyramidal, rigid form, and numerous narrow leaves, which give it some resemblance to a miniature cypress-tree. It is hence sometimes called Summer Cypress.

Belvoir. See MANNERS, FOXHUNTING.

Belzo'ni, GIOVANNI BATTISTA, a famous traveller, was born, the son of a poor barber, at Padua in 1778. He was educated at Rome for the priesthood, but soon displayed a preference for mechanical science, and when the French republican troops took possession of the pontifical city, quitted his religious studies altogether. About the year 1800 he visited Holland, and in 1803 came to England. Six feet seven inches tall, for a time he gained a living by exhibiting feats of strength, at first in the streets, and afterwards at Astley's. At the same time, however, he continued his mechanical studies, and exhibited models of hydraulic engines in the large towns of the kingdom. After a sojourn of nine years in England, he went to Spain and Portugal in his capacity of theatrical athlete. From the Peninsula he passed to Malta, and thence to Egypt in 1815, on the invitation of Mehemet Ali, who wished him to construct a hydraulic machine for the irrigation of his gardens near Cairo. Although he succeeded in this undertaking, the design was abandoned by the pasha, and Belzoni was induced by the traveller Burckhardt and Mr Salt, the British consul, to direct his attention to the exploration of Egyptian antiquities. He threw himself with ardour into his new vocation. He removed the colossal bust of the so-called 'Young Memnon' from the neighbourhood of Thebes to Alexandria, and was the first who opened the temple of Abu-Simbel. In the valley of 'the tombs of the kings'—Bibân-el-Moluk—near Thebes, he discovered several important catacombs containing mummies, and among others, opened in 1817 the celebrated grotto-sepulchre of Seti I., from which he removed the splendid sarcophagus, now, along with the 'Young Memnon,' and other results of Belzoni's labours, in the British Museum. But his greatest undertaking was his opening of the second pyramid of Gizeh, supposed since Herodotus' time to contain no interior chamber. An attempt made on his life caused his departure from Egypt, but previously he made a journey along the coast of the Red Sea, and another to Lake Moeris and the Lesser Oasis, which he erroneously supposed to be that of Siwah (q.v.), in search of the ruins of the temple of Jupiter Ammon. In the course of his explorations he discovered the emerald mines of Zubara and the ruins of Berenice, the ancient commercial entrepôt between Europe and India. In 1819 he returned to Europe, and in 1821 published at London his *Narrative of Excavations in Egypt and Nubia*. In 1821 he opened in London a successful exhibition of his Egyptian antiquities, which he took to Paris in the following year. Becoming restless, he soon afterwards undertook a journey to Timbuktu, in Central Africa. At Benin he was attacked by dysentery, from which he died at Gato, December 3, 1823.

Bem, JOSEPH, a Polish leader of the Hungarian insurgents, was born in 1795 at Tarnov, in Galicia. After thirteen years' military service (1812-25), and after taking an active part in the Polish rebellion of 1830-31, he went to France, where he earned a livelihood by teaching mechanics and mnemonics. In 1848, having failed in an attempt to organise an insurrection in Vienna, he joined the Hungarians, and was intrusted with the command of the army of Transylvania, amounting to

10,000 men. He soon defeated the Austrians in several engagements, announcing his victory over the famous Ban Jellachich in the laconic despatch, *Bem Ban Bum* ('Bem has beaten the Ban'); and finally succeeded, in March 1849, in driving both them and their allies, the Russians, into Wallachia. He then proposed, by amnesties and general mild rule, to gain the adherence of the German and Slavonic population; but his propositions were not entertained by Kossuth and the Hungarian commissariat. After expelling the troops under Puchner from the Banat, Bem returned into Transylvania, where the Russians had defeated the Hungarians. Here he was defeated in a battle near Schässburg, where he was opposed to three times the number of his own troops. At Kossuth's request he now hastened into Hungary, and took part in the unfortunate battle near Temesvar. Retreating into Transylvania, he defended himself for some days against a vastly superior force, and then made his escape into Turkey, where he embraced, from political motives, the profession of Islam, and, as Amurat Pasha, obtained a command in the Turkish army. In February 1850 he was sent to Aleppo, where, after suppressing the sanguinary insurrection of the Arabs against the Christian population, he died of fever, December 10, 1850. Bem was distinguished as a general by promptness and courage, and his personal kindness made him popular with his followers.

Bembato'ka, BAY OF, a safe and commodious bay on the NW. coast of Madagascar, in 16° S. lat. and 46° E. long. The river Betsiboka, with the Ikiopa, drain into the bay; the former, which is about 300 miles long, is navigable for small steamers for about 90 miles. Majunga, on the north side of the bay, is the second port in the island, with about 7000 inhabitants, Bembatoka being but a village.

Bembex (i.e. 'whirl'), a genus of solitary sand-wasps (Sphegidae), represented by numerous species in most parts of the world. They are roughly wasp-like in appearance, with broad heads and very large eyes, and make a loud buzz during their rapid flight. The female bembex burrows a hole in the sand, and there deposits her eggs, but before closing it up collects a store of flies, on which the larvæ at first subsist. See WASP.

Bembo, PIETRO, one of the most celebrated Italian scholars of the 16th century, was born in Venice, May 20, 1470; having studied at Padua and Ferrara, he early devoted himself to polite literature. He edited the Italian poems of Petrarch, printed by Aldus in 1501, and the *Terzerime* of Dante, 1502. In 1506 he proceeded to the court of Urbino, where he resided until 1512, then went to Rome, and was made secretary to Pope Leo X. On the death of that pope, Bembo returned to Padua, where he became a liberal patron of literature and the arts, as well as a prolific writer himself. In 1529 he accepted the office of historiographer to the republic of Venice, and was also appointed keeper of St Mark's Library. In 1539 Bembo, who had taken only the minor ecclesiastical orders, was unexpectedly presented with a cardinal's hat by Pope Paul III., who afterwards appointed him to the dioceses of Gubbio and Bergamo. He died January 18, 1547. Bembo united in his character all that is amiable. He was the restorer of good style in both Latin and Italian literature. His taste is said to have been so fastidious with regard to style, that he subjected each of his own writings to forty revisions previous to publication. Some of them are marred by the licentiousness of the time. Among his works may be mentioned the *Rerum Veneticarum Libri XII.* (Venice, 1551; Italian ed. 1552); his little

treatise on Italian prose, which marked an era in Italian grammar; *Gli Asolani*, a dialogue on Platonic love; *Rime*, a collection of sonnets and canzonets; and his Letters, Italian and Latin. His *Tutte Opere* were published at Venice in 4 vols. in 1729, and often since.

Bembridge Beds, a division of the Oligocene strata, resting on the Osborne, and capped by the Hamstead series, are principally developed in the Isle of Wight. Edward Forbes arranged the Bembridge Beds in four divisions, thus: (1) The upper marls and laminated gray clays, which form the basement bed of the 'black band,' the lowest member of the Hamstead series. They are distinguished by the abundance of *Melania turretis-sima*. (2) Unfossiliferous mottled clays, alternating with fossiliferous marls and clays, whose characteristic organisms are *Cerithium mutabile* and *Cyrena pulchra*. (3) The oyster-bed, consisting of greenish marl, and containing immense quantities of a species of oyster (*Ostrea vectensis*), accompanied with *Cerithia*, *Mytili*, and other marine mollusca. (4) The Bembridge limestone, generally a compact, pale-yellow, or cream-coloured limestone, but sometimes vesicular and concretionary, and containing occasionally siliceous or cherty bands. This is interstratified with shales and friable marls. All the beds are fossiliferous, containing numerous land and fresh-water shells. One bed is composed almost entirely of the remains of a little globular *Paludina*. Shells of *Lymnea* and *Planorbis* are abundant, and are accompanied with the spirally striated nucleuses of two species of *Chara*, water-plants which have been well preserved because of the large quantity of lime which enters into their composition. In this division have been found the mammalian remains of the species of *Palæotherium* (q.v.) and *Anoplotherium* (q.v.), which characterise the gypseous deposits of Montmartre.

Bemersyde, an estate with an old mansion, in Berwickshire, near the Tweed, $3\frac{1}{2}$ miles E. of Melrose, held since the 12th century by the Haigs, was in 1921 given by subscribers to Earl Haig. See an excellent monograph by John Russell (1881).

Ben (Heb. and Arab., 'son'), often used in connection with the father's name to form Jewish and Arabic personal names, and consequently used, owing to the lack of family-names among the Semitic peoples, to form patronymics—thus Ali Ben Hassan = Ali, son of Hassan. The Hebrew form *Ben* is familiar to us from its use in Bible names—e.g. Benhadad, 'the son or worshipper of Hada' or Adad, the chief idol of the Syrians; Benoni, 'son of my pain'; Benjamin, 'son of the right hand,' &c. Similarly, many Jews have formed with this prefix new family-names, as Benary = the son of Ari, analogous to English names in *-son*. The Arabs, Persians, and Turks often make the prefix into *İbn* (*Ebn*); the Jews, under Arabic influ-

ences, *Aben*, *Aven*, as in Aben Esra. The plural, *Beni*, is found in the names of many Arab tribes—as Beni Omayyah, 'the sons of Omayyah,' the family known in history as the Omniades; and sometimes in the names of places—as Beni-Hassan (see BENI-ISRAEL). The corresponding word in Aramaic is *Bar*, as in Simon Bar-jona.

Ben, or BEINN, the Gaelic and Irish form (Welsh *Pen*) of a Celtic word signifying 'mountain' or 'mountain head.' It occurs, usually as a prefix, in the names of a great many mountains and places within the British Isles, as *Ben Nevis*, *Ben Macdhui*, *The Twelve Pins*, *Pennigant*, *Penzance*; and it appears in many continental names, as the *Pennine* Alps, the *Apennines*, and *Pindus*.

Ben, OIL OF, a fluid fixed oil, obtained from the seeds of the Horse-radish Tree (*Moringa pterygosperma*), found in India and Arabia, and other species. The seeds are called Ben Nuts, and are roundish, with three membranous wings. The oil has several properties which make it of special value to perfumers and watchmakers. When exposed to cold, it deposits a white flaky matter; and when this is removed, an oil is left which is most suitable for watches owing to its non-liability to freeze. Oil of ben is also used to extract the odorous principles from flowers; and as it is not liable to turn rancid, it is much prized in the manufacture of perfumes, although its frequent adulteration with other oils has tended to restrict its use.

Benares (*Banāras*), the most sacred city of the Hindus, and one of the principal towns of North India, situated on the left or northern bank of the Ganges, 420 miles by rail from Calcutta, and 74 from Allahabad. After Lucknow it is the largest city in the United Provinces of Agra and Oudh. It skirts the Ganges for 3 miles, and the high bank is lined continuously with broad flights



The Burning Ghat, Benares.

of stairs or *ghāts*, leading to the innumerable temples and large substantial houses, which present towards the river an imposing array of towers and pinnacles and richly carved façades. The river takes a great crescent-like sweep at this point, and the view of the city is one of the most striking in the world. Benares, however,

is disappointing internally, the streets being mere narrow lanes between the lines of tall, dismal houses. But the crowds of priests and pilgrims on the ghats and at the temples, the sacred bulls wandering at large, and even the wares exposed for sale, all point to the religious character of the place. Among the chief buildings are the Nepalese Temple; Aurungzebe's mosque, with its two minarets 147 feet high; Raja Jai Singh's observatory; the Gopal Mandir, wealthiest of all the temples; the Bisheswar or Golden Temple of Siva, the holiest of all; and the famous Monkey Temple, in the suburbs. Other points of special interest are the well of Mani Karnika, formed of Vishnu's sweat; the Juana-vapi, or 'pool of knowledge'; and the Lat Bhairo, a portion, it is believed, of one of Asoka's pillars. To bathe in the Mani Karnika is to be cleansed from all sins for time and eternity. At the Burning Ghat the bodies of Hindus are reduced to ashes. The city counts 1450 Hindu temples or shrines, most of them small, and 272 Mohammedan mosques. The Hindu University (residential and teaching; founded 1915-16) is now responsible for the Central Hindu College, founded by Mrs Besant; Queen's College, a government institution, is affiliated to Allahabad University. Notable buildings are the hospital and the town-hall. The great Dufferin (railway) Bridge, opened in 1887, crosses the Ganges in sixteen spans. Its length without approaches is 3578 feet. Formerly there was only a bridge of boats, withdrawn during the floods. Benares draws immense revenues from the thousands of pilgrims who visit it from all parts of India. It has a considerable trade, not only in country produce, but in English goods, jewellery, and precious stones. Its brass-ware, kinob or gold-cloth, and lacquered toys are famous. Pop. (1881) 191,025; (1891) 222,420; (1911) 203,804; (1921) 199,993—three-fourths Hindus.—A city of great antiquity, Benares (Sansk. *Vārāṇasī*) was for 800 years the headquarters of Buddhism. In the 4th century B.C. it reverted to the ancient faith, of which it has ever since been the metropolis. It has been in the hands of many temporal rulers—the Rajput princes, the Mogul emperors, the Oudh nawabs—being ceded by the latter to the English in 1775. There was a rising here during the Mutiny in 1857, but it was promptly dealt with, and the constant passage of troops from Calcutta to the north kept the city free from disturbance. The western suburb of Sikrol (Secrole) contains the military cantonments and European quarter; the suburb of Sighra is the seat of most of the missionary institutions.—The district has the hottest and dampest climate in the United Provinces, the mean temperature being 77°, and the annual rainfall about 40 inches. See books on the city, also called 'Holy Kasi,' by E. B. Havell (1906), and W. Phillips Cape (1909).

Benares, an Indian state constituted in 1910-11, includes Bhadohi, Kera Mangraur, and (since 1918) Ramnagar, all in Mirzapur district; area, 1000 sq. m.; pop. 363,000.

Benavente, a town of Spain, 34 miles N. of Zamora, is overlooked by a huge half-ruined castle, and is now a dull and poverty-stricken place, built chiefly of mud cottages. It was here that Moore's retreat commenced, 28th December 1808. Pop. 4500.

Benbecula, one of the Hebrides or Western Isles of Scotland, between North and South Uist, 20 miles W. of Skye, and belonging to Inverness-shire. Measuring 6 or 7 miles either way, it is nearly 36 sq. m. in area, low and flat, and consists chiefly of bog, sand, and lake, resting on a substratum of gneiss rock, with a very broken coastline. Nearly three-fourths of the area are under crofts and farms. Pop. 1300.

Benbow, JOHN, admiral, was born in 1653, the son of a Shrewsbury tanner. He entered the navy as a master's mate in 1678, but it was as captain of a merchantman that he first distinguished himself in a bloody action with Sallee pirates (1686). After the Revolution he re-entered the navy, and received his first commission as third-lieutenant, June 1, 1689; but before the close of the same year he was appointed in succession captain to three men-of-war, and by 1696 had risen to be rear-admiral. The most memorable of all his exploits was his last, where his stubborn valour contrasted nobly with the disloyal behaviour of his captains. Off Santa Marta, in the West Indies, on 19th August 1702, he came up with a superior French force under Du Casse. For four days he kept up a running fight with the enemy, almost deserted by the rest of his squadron. On the morning of the 24th his right leg was smashed by a chain-shot. His officers consoled with him. 'I had rather have lost them both,' said the sturdy admiral, 'than have seen this dishonour brought upon the English nation. But, hark ye—if another shot should take me off, behave like men, and fight it out!' As soon as his wound was dressed he was carried to the quarter-deck, and directed the fight while it lasted. The enemy sustained severe loss; but the behaviour of the other captains, who actually refused to obey the admiral's signals, made the contest hopeless, and Benbow sailed away to Jamaica. He died of his wound at Port Royal, on the 4th November. The recusant officers were tried by court-martial, and two captains were shot. Cowardice is none so common among English naval officers that we can rest content with that as an explanation of the strange conduct of Benbow's captains in their mutinous disobedience to his orders. Indeed, it is more than likely that their disaffection was to a large extent a personal matter, and that the 'honest, rough seaman,' by his overbearing and bullying nature, had made himself as hateful to his higher officers as he was popular with his crew for his off-hand manners and personal courage.

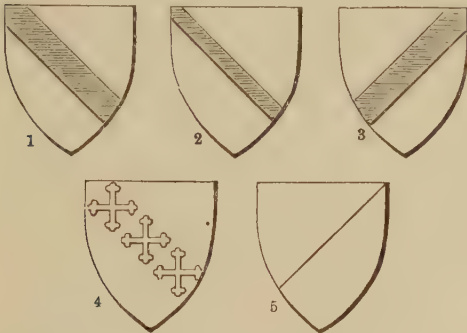
Bench, the high seat of the court-room or chamber where judges sit to administer the laws, or the platform on which the chairs for the judges are placed. The court of King's or Queen's Bench (q.v.) was originally so called because in it the sovereign sat in person when he administered justice. The court of Common Pleas was also called Common Bench. The term bench is also applied in America as in Britain to the judges themselves as a class; thus, we speak of the *bench* and *bar*. It has likewise, popularly and conventionally, an ecclesiastical application, the bishops of the Church of England being, as a body, sometimes designated by it; hence the expression, 'Bench of Bishops.' So also in the Episcopal and Methodist-Episcopal churches in the United States. 'Benchers' is the time-honoured name of the governing bodies of the four Inns of Court (q.v.). See also BANC.

Bench-warrant is a warrant issued by the court before which an indictment has been found to arrest the accused, that he may appeal and find bail for his appearance at the trial. It is used extensively in the United States to bring into court persons who have neglected to obey an order of court, such as delinquent jurymen.

Bencoe'len, capital of a Dutch residency on the SW. coast of Sumatra. Owing to the surf and coral reefs, landing here is difficult. The site is low and swampy, and the houses are mostly built on bamboo piles. There is a lighthouse; and the town is defended by a fort. Rice, coffee, maize, sugar-cane, the coconut, and other fruits are grown;

pepper and camphor are the chief exports, but trade has declined. Bencoelen was founded by the English (1636), but was ceded to the Dutch by the London treaty of 1825. Pop. of town, 12,000; of residency, with an area of 10,000 sq. m., 260,000.

Bend, in Heraldry, one of the figures known as Ordinaries, consists of the space contained between two parallel lines crossing the shield diagonally from dexter chief to sinister base (fig. 1). It is said to occupy a fifth part of the shield unless charged, when it occupies a third part. Its diminutives are the *Bendlet*, which is half its width (fig. 2), the *Cotise* (q.v.), one-fourth (generally borne in pairs flanking the bend), and the *Ribbon*, one-eighth of its width. In early Heraldry the bend was used as a difference or mark of cadency as well as an original bearing.



The *Bend-sinister* is an occasionally occurring variety of the bend, drawn from sinister chief to dexter base (fig. 3). The *Scarpe* is its diminutive; and that well-known mark of illegitimacy, the *Baton-sinister* (q.v.), is also so accounted.

Charges placed in the direction of a bend are said to be *bendwise*, and when a bend is charged with other figures, the charges on it are understood to be placed bendwise. The term *bend*, when applied to several charges, differs from *bendwise*, in so far as it has reference to the relative position of the charges, not the direction in which each charge lies, as will be understood from the figure,



where the three crosses botonné are placed *palewise in bend* (fig. 4).

A field divided by a diagonal line in the direction of a bend is said to be *parted per bend* (fig. 5).

Bendy is a term applied in Heraldry to a field divided into four or a larger even number of parts by lines drawn diagonally, or in the direction of a bend

as in the figure, *Bendy* of six argent and azure.

Benda, GEORG, the most distinguished of a notable musical family, born at Jungbunzlau, in Bohemia, in 1721, and distinguished as a pianist, violinist, and composer, died at Köstritz in 1795. He was bandmaster to the Duke of Gotha (1748-87), and in this period produced several operas and cantatas, such as *Ariadne auf Naxos* and *Medea*.

Bendemann, EDUARD, painter, was born in Berlin in 1811, and studied under Schadow. As early as 1832 his great picture of the Captive Jews was exhibited at Berlin, and in 1837 he gained the gold medal at Paris. In 1838 he was appointed professor of the Academy of Art at Dresden. Here he was intrusted with the execution of the larger frescoes in the palace, and on these his fame chiefly depends. In 1858 he succeeded his

father-in-law as director of the Düsseldorf Academy. He died 27th December 1889.

Bender, or **BENDERY**. See TUGHINA.

Bender Abbas, or **BANDER ABBAS**, also called **GOMBROON**, a seaport of Persia, in the province of Kirman, stands on the Strait of Ormuz, opposite the island of that name. Bender Abbas owed its name and importance to Shah Abbás, who, assisted by the English, drove the Portuguese in 1622 from Ormuz, ruined that seaport, and transferred its commerce to Gombroon. For a while the new town prospered; but at present it is a wretched place of about 8000 inhabitants, mostly Arabs.

Ben'digo, at one time called Sandhurst, the centre of a rich gold-bearing district in Victoria, Australia, 101 miles by rail NNW. of Melbourne. The discovery of gold was made in 1851, and the field at once became second only to Ballarat. Later on it developed exceptional importance as a quartz-reefing field, and it is still the richest in Victoria, although Coolgardie in Western Australia far surpasses it, and Mount Margaret (W.A.) is slightly richer. There are many deep shafts, one of more than 4600 feet. The city, which has an excellent water-supply and good public gardens, has been a municipality since 1855. It has many fine public buildings, banks, &c., and the breweries, iron-foundries, and brick-fields usual in a town of the size. It is also an important railway centre, being the junction of lines from Melbourne (*via* Castle-maine) and Kilmore, and from Echuca, Swan Hill, and the mallee districts on the north and north-west. Pop. 33,000.

Benedek, LUDWIG VON, an Austrian general, born in 1804 at Oedenburg. He commanded a regiment in Italy in 1847, and distinguished himself at Mortara and Novara. In 1849 he commanded in Hungary, and took an important share in several battles, being twice wounded. In the Italian campaign of 1859, he drove back the Piedmontese at Solferino with great slaughter. In 1866 he commanded in the war with Prussia, but after the defeat of Sadowa was superseded and court-martialled. He died 27th April 1881.

Beneden, PIERRE JOSEPH VAN (1809-94), born at Mechlin, became professor of zoology and palæontology at the Catholic university of Louvain in 1836, and wrote on the cetacea, parasites, and other departments of natural history.—His son EDOUARD (1846-1910), professor at Liège, was an eminent embryologist and cytologist.

Benedetti, VINCENT, COUNT, a French diplomatist, born in 1817 at Bastia, in Corsica, was appointed in 1855 director of political affairs to the foreign minister, and in this capacity edited the protocols of the Congress of Paris in the following year. He was appointed ambassador at Turin in 1861, and at Berlin in 1864. Benedetti drew up the draft of a secret treaty between France and Prussia in 1870; and it was he who made at Ems the demand about the Hohenzollern candidature that led to the war. In *Ma Mission en Prusse* (1871) and *Studies in Diplomacy* (Eng. trans. 1895) he defends his own policy and throws all blame on Bismarck. He retired to Corsica, practised at the bar of Ajaccio, and died 28th March 1900.

Benedic'té, or the Song of the Three Children, a canticle from the Apocrypha forming part of the prayer of Abednego in the fiery furnace. It was sung in the Christian Church as early as the time of St Chrysostom, and is used in the Anglican Church in the morning services when the *Te Deum* is not sung.

Benedict is the name of fifteen popes. **BENEDICT VIII.**, son of Count Gregory of Tuscoli, was elected in 1012, but was driven from Rome by the anti-pope Gregory. In 1014 he was restored to the

papal chair by the Emperor Henry II., and afterwards defeated the Saracens, and took from them, with the help of the Pisans and Genoese, the island of Sardinia; and also various places in Apulia from the Greeks, by the help of Henry. He distinguished himself as a reformer of the clergy, and interdicted, at the synod of Pavia, both clerical marriage and concubinage. He died in 1024.—BENEDICT IX., a nephew of the preceding, obtained the papal throne by simony in 1033, at the age of eighteen; but in 1038 the Romans rose in indignation, and banished him on account of his almost unexampled licentiousness. By aid of bribery he was several times reinstalled, and as often formally deposed, only to return again by the same means. The Emperor Henry III., to remove such gross scandals from the church, deposed all the three popes—Benedict, Sylvester, and Gregory, and caused Snidger, Bishop of Bamberg, to be elected as Clement II.; but on his death, in 1047, the deposed Benedict IX. again corruptly regained the papal see, and held it for eight months, when he was displaced, first by Damasus II., and afterwards by Leo IX. He died in the convent of Grotta Ferrata in 1056.—BENEDICT XIII. is a title assumed by two popes, *Peter de Luna*, a Spaniard, chosen by the French cardinals in 1394, and recognised only by Spain and Scotland up to his death in 1424; and *Vincenzo Marco Orsini* (1724–30), a learned and well-disposed man, of simple habits and pure morals, who unfortunately yielded himself to the guidance of the greedy and unscrupulous Cardinal Coscia, who greatly abused the confidence reposed in him. Benedict always exhibited great moderation in politics, and an honourable love of peace, and was instrumental in bringing about the Seville treaty of 1729. During this pontificate a remarkably large number of saints, chiefly from the monastic orders, were added to the calendar.—BENEDICT XIV. (Prospero Lambertini), the most worthy to be remembered of all the pontiffs so named, was born at Bologna in 1675. Before his elevation, he had distinguished himself by extensive learning, and by marked ability in the lower offices. Succeeding Clement XII., he began his pontificate, in 1740, with several wise and conciliatory measures; founded chairs of physic, chemistry, and mathematics in Rome; revived the academy of Bologna, and instituted others; dug out the obelisk in the Campus Martius, constructed fountains, rebuilt churches; caused the best English and French books to be translated into Italian; and in many other ways encouraged literature and science. His piety was sincere, enlightened, and tolerant, and his doctrines were well exemplified in his practice. He was extremely concerned for the morals of the clergy, and established a board of examiners for all candidates to vacant sees. Two important bulls were promulgated by him, denouncing such accommodation of Christian doctrines and rites to heathen beliefs and usages as the Jesuits had practised in the East. The only accusation brought against him by his Roman subjects was 'that he wrote and studied too much, but ruled too little,' or left affairs of business too much in the hands of the Cardinal Valentine. He died 3d May 1758.—BENEDICT XV. (Giacomo della Chiesa) was born 21st November 1854, of a noble Italian family, at Pegli, near-Genoa. He studied law, but was ordained in 1878. Five years later he became secretary to the Papal Embassy at Madrid, and in 1887 secretary to Cardinal Rampolla. In 1907 he became archbishop of Bologna, in May 1914 a cardinal, and, after an unusually short interval, was elected pope in September. He made several ineffectual efforts to end the Great War. During his pontificate official relations with France and Great Britain were resumed. He died 22d January 1922.

Benedict, Sr, the founder of Western monachism, was born of a wealthy family at Nursia, near Spoleto, in 480 A.D. At an early age he was sent to the schools of Rome, but soon grew dissatisfied with the sterile character of the instruction dispensed. The world to the boy seemed full of distractions, impurities, and ignorance; it was difficult to resist, by the ordinary safeguards of virtue, the colossal evils with which men were environed; only, therefore, in the devotions of religion, in the holy silence of solitary meditation, did Benedict see a safe refuge from the sins of the time, and the possibility of realising a spiritual strength which would enable him to stem the flood of corruption. He resolved to leave the city, and betake himself to some deep solitude where the murmur of the world would be inaudible, and alone in the rocky wilderness wrestle with his own nature, until he had conquered it and laid it a sacrifice on the altar of God. In pursuance of this resolution, when he had only reached the age of fourteen, he departed from Rome, accompanied for the first 25 miles by the nurse whom his parents had sent with him as an attendant. He then left her, and retired to a deserted country lying on a lake, hence called *Sublaqueum* (now Subiaco). Here, in a cavern (which afterwards received the name of the Holy Grotto), he dwelt for three years, until his fame spread over the country, and multitudes came to see him. He was now appointed abbot of a neighbouring monastery, observing, or rather neglecting, the oriental rule; but soon left it, as the morals of the half-wild monks were not severe enough. This, however, only excited a livelier interest in his character, and as he lived in a period when the migration and interfusion of races and nations were being rapidly carried on, he could not fail to draw crowds of wanderers about him. Wealthy Romans also placed their sons under his care, anxious that they should be trained for a spiritual life. Benedict was thus enabled to found twelve monasteries, over each of which he placed a superior. The savage Goths even were attracted to him, and employed in the useful and civilising practice of agriculture, gardening, &c. He now sought another retreat, and, along with a few followers, founded a monastery on Monte Cassino, near Naples, afterwards one of the richest and most famous in Italy. Here he extirpated the lingering relics of paganism, and had his celebrated interview with Totila, king of the Goths, to whom he spoke frankly and sharply on his errors. In 515 he is said to have composed his *Regula Monachorum*, in which he aimed, among other things, at repressing the irregular and licentious life of the wandering monks, by introducing stricter discipline and order. It eventually became the common rule of all Western monachism. The monasteries which Benedict founded were simply religious colleges, intended to develop a high spiritual character, which might beneficially influence the world. To the abbot was given supreme power, and he was told to acquit himself in all his relations with the wisdom of God and of St Benedict. The discipline recommended is milder than that of oriental monachism with regard to food, clothing, &c.; but enjoins continual residence in the monastery, and, in addition to the usual religious exercises, directs that the monks shall employ themselves in manual labours, imparting instruction to youth, copying manuscripts for the library, &c. By this last injunction, Benedict, though this was not directly intended, preserved many of the literary remains of antiquity; for the injunction, which he gave only with regard to religious books, was extended afterwards to many secular productions. It is remarkable that the founder of the most learned of all the monastic orders was himself so

little of a scholar that St Gregory the Great described him as being '*scienter nesciens, et sapienter inductus*'—learnedly ignorant, and wisely unlearned. St Benedict died March 21, 543.

Benedict, SIR JULIUS, a musician and composer, German by birth, but after 1836 resident in England. Born November 27, 1804, at Stuttgart, where his father was a Jewish banker, he studied first under Hummel at Weimar, and afterwards under Weber at Dresden. On Weber's recommendation, he was, in 1824, made musical director of the German Opera, Vienna; and he afterwards was appointed to the conductorship of the San Carlo Theatre in Naples. While in Naples, he produced an opera buffa called *Giocinta ed Ernesto*, and an opera seria, *I Portoghesi in Goa*. Both were too German to suit the Italian taste, but later they were well received at Stuttgart. In Paris, and afterwards (1835) in London, he appeared with great success as a pianist. In 1836 he took up his permanent residence in London, and was, during that year, director of the opera buffa at the Lyceum, where he produced an operetta, composed in Naples, *Un Anno ed un Giorno*. Turning his attention afterwards to English opera, he composed *The Gipsy's Warning* (1838). *The Brides of Venice* (1844), and *The Crusaders* (1846), three works which, translated into German, have been well received in the composer's native country. He conducted the opera in Covent Garden Theatre in 1843 and 1844, and the Norwich Musical Festival in 1845, and thereafter conducted the Monday Popular and numerous other concerts and great musical gatherings in London and in the provinces, besides being a successful pianoforte teacher. In 1850 he conducted at Jenny Lind's concerts in America. In 1860 he produced a cantata, *Undine*, at the Norwich Musical Festival, which was very well received. His *Lily of Killarney*, first given in 1862 at Covent Garden, was his greatest operatic success. He produced a cantata, *Richard Cœur de Lion* (1863); an opera di camera, *The Bride of Song* (1864); and the cantatas *St Cecilia* (1866) and *Graziella* (1882). His oratorio, *St Peter*, written for the Birmingham Musical Festival, 1870, was perhaps his masterpiece; it met with extraordinary success. His first symphony also was received with great favour in 1873. His music possesses abundance of fresh and pleasing melody, and shows the hand of a consummate master, without, however, any very pronounced individuality of style. In his earlier works the score owed something to Rossini, but his later compositions betray more of the influence of his master, Weber. In style and feeling, however, they are singularly English to be the composition of a foreigner. He was knighted in 1871, and was a corresponding member of the French Academy. He died in London, 5th June 1885. He wrote on Mendelssohn and on Weber.

Benedict Biscop, a great churchman of Anglo-Saxon times, was born about 628 of a good Northumbrian family. At first in the service of King Oswy, he assumed the tonsure in the Benedictine monastery of Lerins, after his second journey to Rome. On his return to England from his third journey, he was appointed abbot of St Peter's at Canterbury, but this office he held only for two years. He made yet another pilgrimage to Rome, and soon after his return received from Egrith of Northumbria, in 674, a grant of land between the Wear and the Tyne. Here he founded a monastery, and endowed it with numerous books which he had collected in his visits to Rome. 'He was,' says William of Malmesbury, 'the first person who introduced in England constructors of stone edifices, as well as makers of glass windows.' In 682

he founded a second monastery at Jarrow. Himself a man of the loftiest character, he did much to advance learning and culture in the church, and to his careful fostering of learning we owe his great pupil Bede. He died 12th January 690.

Benedictine, a liqueur, first made at the monastery of Fécamp early in the 16th century, and since the French Revolution manufactured by a secular company there. See LIQUEUR.

Benedictine Editions. See MAURISTS.

Benedictines, the general name of all the monks and nuns following the rule of St Benedict (480-543). He founded his first twelve monasteries at Subiaco, near Rome; thence he passed to Monte Cassino, near Naples, where he wrote his *Rule*, and founded the abbey which is still famous. In his lifetime his disciple, St Placid, spread his order in Sicily; and St Maurus in France. St Gregory the Great was the first (590-604) of the fifty Benedictines who have occupied the papal throne, a list which includes such names as St Leo IV., St Gregory VII., and St Pius VII., and which ends with Gregory XVI. (1831-46). St Augustine, the disciple of Gregory the Great, brought the Benedictine rule to England along with the Christian faith, and became the first of a long list of Benedictine archbishops of Canterbury. The English Benedictine, St Boniface, preached the faith in Germany, and founded there the great abbey of Fulda. Ansgar, the apostle of Denmark; Willibrord, of the Frisians and Dutch; Adalbert, of the Bohemians; and Casimir, of the Poles, were all Benedictines. Benedict Biscop, Bede, and Anselm in England; Isidore, Leander, and Ildefonsus in Spain; Peter Damiani in Italy, and Bernard in France, are names which illustrate the hold this order had upon the teaching of the Catholic Church. As early as 1354 the order had numbered 24 popes, 200 cardinals, 7000 archbishops, 15,000 bishops, 1560 canonised saints, and 5000 holy persons worthy of canonisation, a number since increased to 40,000. It had possessed 37,000 monasteries, 20 emperors, 10 empresses, 47 kings, 50 queens, and an immense number of royal and noble persons. In the 15th century there were 15,107 Benedictine monasteries. The Reformation left not more than 5000.

The Benedictines were grouped into 'orders' and 'congregations,' named after their first abbey, their founder, their patron saint, or their country. The first of these was established at the abbey of Clugny (q.v.) in 910. At Cîteaux (*Cistercium*) the Cistercians (1098) were organised. In Italy St Romuald founded the order of Camaldoli (1009), St John Gualbert that of Vallombrosa (1070), St William that of Monte Vergine (1119). Other congregations were named from Fontevault (1099), Tiron (1109), and Savigny (1112). The Silvestrines (1231) and Celestines (1274) bear the names of their founders; the Olivetans (1319) that of their first abbey. The congregation of Monte Cassino was formed by the union of several abbeys in Italy in 1415, and still exists, though much shorn of its strength. The great abbey of St Paul's in Rome belongs to it. The principal congregation in Germany was that of Bursfeld, which disappeared with the Reformation; but in 1868 the congregation was re-established at Beuron in Hohenzollern-Sigmaringen, and it has now several daughter-abbeys. In Austria and neighbouring countries a score survive out of a much larger number of independent abbeys, of which many date back to the 8th and 9th centuries. The principal are Salzburg, Melk, and Krems in Austria; Martensberg in Hungary. In 1712 a congregation of Armenian Benedictines established itself at San Lazzaro, near Venice, under the name of

their founder Mechitar, and still continues a source of religion and learning for its mother-country. In France the congregation of St Vanne was erected in 1600; along with that of Tiron it was absorbed into that of St Maur in 1627 (see MAURISTS).

The Revolution of 1792 swept all away, but in 1837 D. Gueranger founded the 'French Congregation' at Solesmes; the law of 1903 dispersed the congregation, some of whom established themselves in England. In 1905-10 there were in all in the 'Benedictine Federation' 16 congregations, with 155 monasteries and 5940 monks; besides 142 monasteries of Camaldolese, Vallombrosans, Cistercians and Trappists, Sylvestrines, Olivetans, and Mechitarists, with 5347 religious in them. The English congregation was founded in 1300 by the union of all the English monasteries then existing. It included, among the 113 numbered by Tanner, all the greater abbeys and cathedrals, and four other abbeys which have since become cathedrals of England. It was despoiled at the Reformation, and its few surviving members took refuge and multiplied abroad, whence they returned at the French Revolution. In Scotland the principal Benedictine monasteries were Coldingham, Dunfermline, and Iona; Kelso, Kilwinning, Arbroath, and Lindores (Tyronensian); Melrose, Newbattle, Dundrennan, and Kinloss (Cistercian); and Paisley (Cluniac). The abbey of Fort Augustus, the only one now in Scotland, was founded 1878, and in it is perpetuated whatever remained of the Scottish abbey at Ratisbon. During the 19th century the order spread widely in the United States, the mother-abbey being St Vincent's, Pennsylvania. Monasteries have been established also in Australia (one among the aborigines) and in New Zealand. In 1851 a new congregation was erected under the presidency of the abbey of Subiaco, one of the original foundations of St Benedict, and has widely propagated.

The *Rule of St Benedict* is a modification of that of the eastern ascetics, St Basil, Cassian, &c. It was the first to introduce *Stability*, or the binding of the monk to a permanent abode in a monastery, and in the practice of monastic life till death. This is the first of the Benedictine's three vows; the second is *Conversion of Manners*—i.e. the striving after perfection of life; and the third, *Obedience according to the Rule*, by the tenor of which the monk is bound to chastity, to the renunciation of private property, to retirement from the world, to the daily and public solemnisation of the divine office, and to a life of frugality and labour under filial obedience to the abbot. Hospitality and the other works of mercy, corporal and spiritual, are strongly inculcated in the rule, and among these, Benedictine monks have always given a high place to the work of education and instruction in worldly and religious learning. Both these still form the principal subjects of their employment. From the days of Charlemagne to the 12th or 13th century, the Benedictine monasteries were almost the only repositories of learning; the literary labours of the Maurists in the 18th century are proverbial, and to this day it would be difficult to find a Benedictine monastery without at least its 'internal' school of philosophy and theology. The modern congregation of Beuron is famous for its school of art.

The Benedictine habit consists of a tunic and Scapular (q.v.), over which is worn a long full gown called a *cowl*, with a *hood* to cover the head. The colour is not specified in the rule, and it is conjectured that the early Benedictine wore white as being the natural colour of undyed wool. For many centuries, however, black has been the prevailing colour, whence the term 'black monk' comes to

mean a Benedictine in general, or one who does not belong to certain congregations which have a special colour—e.g. the Camaldolese, the Cistercians and Olivetans wear white, and the Sylvestrines blue. The latter are numerous in Ceylon.

St Benedict's twin-sister Scholastica is supposed to have lived under his rule, and Benedictine nuns have always been as numerous as Benedictine monks. At present the number of their convents probably much exceeds that of the monasteries of men.

See *Annales Ordinis Sti Benedicti*, and *Acta Sanctorum Ordinis Sti Benedicti*, by Mabillon; Reyner, *Apostolatus Benedictinorum in Anglia*; *Album Benedictinum* (St Vincent's, Pennsylvania, 1880); *The Holy Rule of St Benedict* (Fort Augustus, 1885); Montalembert, *The Monks of the West* (trans. 1895); Father Taunton, *The English Black Monks of the Order of St Benedict* (1897); Abbot Butler, *Benedictine Monachism* (1919); and MONACHISM.

Benediction (Eccles. Lat. *benedictio*) is a solemn invocation of the Divine blessing upon men or things, and in its simplest form may be considered almost coeval with the earliest expressions of religious feeling. The Sabbath is said to have been blessed. Jacob blessed his two grandsons. Christ 'took bread and blessed it,' and 'lifting up his hands,' blessed his disciples. In the primitive church the custom gradually developed itself in various liturgical forms. In Protestant churches a form of benediction is used at the close of religious services. In the Roman Church a priestly benediction has been defined as a formula of imperative prayer, which, in addition to the desire which it expresses, transmits a certain grace or virtue to the object over which it is pronounced. Such ecclesiastical benedictions are generally accompanied with the sprinkling of holy water and the use of incense, and universally with the sign of the cross. Prescribed forms may be gathered from the missal, breviary, and pontifical, or may be found collected in the *Benedictionale Romanum*. Certain blessings form part of the liturgical services which only occur at stated seasons, as the blessing of the candles on Candlemas Day, of the ashes on Ash Wednesday, and of the palms, the sacred fire, the incense grains, the paschal candle, font and baptismal water, during Holy Week. Many ancient and curious ceremonies are used at the blessing of altars or of church-bells by the bishop. Other objects for which special blessings are provided in the *Benedictionale* are fields, houses, ships, cattle, noxious animals, articles of food, and even railroads and telegraphs. Water mingled with blessed salt for the devotional use of the faithful in church or at home is as a rule prepared every week. This *aqua benedicta* or holy water in turn conveys a blessing to persons or objects aspersed with it. Priests having special faculties for the purpose may bless crosses and rosaries, which only, when so blessed, impart the papal indulgence to those who use them. So great was the importance attached by Roman Catholics to this delegated papal blessing, that in 1571 the English parliament, in retaliation against the pope for attempting to depose Elizabeth, imposed the penalties of *præmunire* on any one who should bring into the realm an *Agnus Dei* (a medal of wax), crosses, pictures, or beads consecrated or hallowed by the Bishop of Rome, or by authority derived from him. The papal benediction conveyed to a dying person carries with it a plenary indulgence. On certain occasions the pope pronounces a solemn benediction *urbi et orbi* (on the city and the world).

BENEDICTION is also the name given in some countries (in French, *Le Salut*) to a brief and popular service of comparatively modern origin in the Roman Church. It consists of certain canticles and antiphons sung in presence of the sacred host,

which is exposed for the occasion on a 'throne' above the altar. The service is concluded by the priest, wrapped in a veil, taking the monstrance which contains the host, and therewith making the sign of the cross over the people, and giving to them in silence the benediction of the most holy sacrament.

Benedic'tus, (1) the fifth movement of the Mass (q.v.), beginning 'Benedictus qui venit,' following the Sanctus; (2) the canticle of Zacharias (Luke, i. 68-79), used in the Roman service of matin-lauds, and thence adopted into the Anglican morning service.

Benedix, JULIUS RODERICK, a German actor, manager, and play-writer, was born at Leipzig in 1811, and died there September 26, 1873. Of his numerous pieces, the best are his comedies, most of which are favourites in Germany, for their humorous, intricate plot, constant change of incident and scene, and natural, but witty, dialogue. His dramatic works fill 27 vols. (1846-74).

Benefice, or BENEFICIUM, was first applied in the Lombard laws and the Constitutions of Charlemagne to the life-interests in land, which were the reward of military service, and afterwards developed into hereditary feudal grants; but is now used in England to denote any kind of church promotion or dignity, but specially a 'benefice with cure of souls,' such as rectories, vicarages, and other parochial cures, as distinguished from bishoprics, deaneries, cathedral preferments, and other ecclesiastical dignities or offices. Some benefices are called *exempt* or *peculiar*, by which is meant that they are not to be under the ordinary control and administration of the bishop; but such exempt or peculiar benefices are nevertheless, so far as relates to pluralities and residence, subject to the archbishop or bishop within whose province or diocese they are locally situated. See DEAN.

There are, in general, four requisites to the enjoyment of a benefice. 1st, Holy orders, or ordination at the hands of a bishop of the established church or other canonical bishop (a Roman Catholic priest may hold a benefice in the Church of England on abjuring the tenets of his church, but he is not ordained again); 2d, Presentation, or the formal gift or grant of the benefice by the lay or ecclesiastical patron; 3d, Institution at the hands of the bishop, by which the cure of souls is committed to the clergyman; and 4th, Induction, which is performed by a mandate from the bishop to the archdeacon to give the clergyman possession of the temporalities. Where the bishop is himself also patron, the presentation and institution are one and the same act, and called the *collation* to the benefice. The spiritual duties of a benefice are those connected with public worship, baptism, marriage, burial, and the administration of the Lord's Supper, with less defined duties of visitation of and intercourse with parishioners. The emoluments of a rector consist of the freehold of the parsonage house, the glebe, the tithes, and other duties; the vicar has only a proportion of these. The rector is liable for the repair of the chancel, and has serious duties in connection with the church and the churchyard, which in the ordinary case are his freehold. (See Cripps or Phillimore on Church Law.) In Scotland, benefices are divided into temporalities or lands and spiritualities or teinds. The former were taken by the crown at the Reformation and erected into lordships in favour of the lords of erection, titulars, and commendators; but in the 17th century most of these estates returned to the crown. These titulars had also rights of drawing teind from other lands, a public grievance, which was settled by the celebrated decrees arbitral of Charles I. The spiritualities, or main body of the teinds, are still held by

the Church of Scotland (see TEINDS, AUGMENTATION, STIPEND). The election of ministers now proceeds under the Patronage Act, 1874. The minister in Scotland has a manse and glebe, but not the same rights in the church or churchyard, as in England. See ADVOWSON, SIMONY, PLURALITY.

Beneficiary is a legal term used in both England and Scotland to denote a person who is in the enjoyment, or is ultimately entitled to the enjoyment, of any interest or estate held in trust by others. The technical term in the law of England is *Cestui que trust* (q.v.). Thus, annuitants, special legatees, and residuary legatees are all beneficiaries. In charitable trusts of a discretionary character there is often doubt as to who the beneficiaries really are, and both under statute and at common law the courts or the commissioners are occasionally asked to reform a charity, which often means changing the class of beneficiaries. Beneficiaries are entitled to protect the trust estate by interdict and injunction against improper acts of the trustees, and also to sue the trustees for an accounting. See TRUST.

Benefit of Clergy. This expression relates to a former state of the law of England, which shows the power of the clergy and the ignorance of the people. The benefit or privilege meant little short of the total exemption of the clerical order, in respect of crimes and offences, from the jurisdiction and authority of the secular magistrate. The only exception to this was the priest being held in custody by the king himself; but even in that case, he could only remain in such regal custody with the pleasure and consent of the bishop, who had entire control over his person, and over the inquiry into his offence. If a priest or 'clerk' happened to be imprisoned by the secular arm, on a criminal charge or capital felony, he was, on the bishop's demand, to be instantly delivered up without any further inquisition; not, indeed, to be let loose upon the country, but to be detained by the ordinary, till he had either purged himself from the offence, or, having failed to do so, had been degraded. The compurgation before the church court was arranged entirely in favour of the accused. This state of things continued till the Statute of Westminster the First (1275), which provided that the prisoner must first be indicted before he could be claimed, and then in the reign of Henry VI. it was settled that the prisoner must first be convicted, and might either then claim his clergy by plea declining the jurisdiction, or, as was most usually practised, after conviction, by way of arresting judgment. The test of admission to this singular privilege was the clerical dress and tonsure—i.e. the claimant must be strictly in orders and not a mere assistant. The statute *Pro Clero* (1350), however, extended it to all manner of clerks, and by later practice it was extended to all who could read, whether of the clergy or laity—a 'mark of great learning in those days—and therefore capable of becoming clerks. Women, however, except professed nuns, were until the Reformation excluded. But laymen could only claim it *once*, and upon so doing were burned on the hand, and discharged; to be again tried, however, by the bishop, whose investigation usually resulted in an acquittal, which, although the offender had been previously convicted by a jury, or perhaps on his own confession, had the effect of restoring him to his liberty, his credit, and his property. The mode in which the test of reading was applied was as follows: On conviction, the felon demanded his clergy, whereupon a book (commonly a psalter) was put into his hand, which he was required to read, when the judge demanded of the bishop's commissary, who was present, *Legit ut clericus?*

and upon the answer to this question depended the convict's fate; if it were simply *legit*, the prisoner was burned on the hand, and discharged; but if *non legit*, he suffered the punishment due to his offence. By a series of statutes most of the serious crimes and all capital crimes had been excluded from benefit of clergy before the end of the 17th century, but it was extended to all persons convicted of clergyable offences, whether they could read or not; and instead of burning on the hand, a discretionary power was given to the judge to inflict a pecuniary fine or imprisonment. Newly-created felonies, which were numerous in the 18th century, were not entitled to the benefit. But all further attempts to modify and improve the law on this subject proving impracticable, the benefit of clergy was at last totally abolished, by statutes of 1779 and 1827; and by a later statute the same was done for the peers.

See Hale's *Pleas of the Crown*, Stephen's *History of the Criminal Law of England*, and a learned essay in Lea's *Studies in Church History* (1904).

Benefit of Inventory, in the Scots law, was a legal privilege whereby an heir secured himself against unlimited liability for his ancestor, by giving up, within the *Annus deliberandi* (q.v.), an inventory of his heritage or real estate, to the extent of which, and no further, was the heir liable. The method of obtaining this privilege was simplified in 1847 and 1868, but it is now superseded by the general declaration in the Conveyancing (Scotland) Act, 1874, that 'an heir shall not be liable for the debts of his ancestor beyond the value of the estate of such ancestor to which he succeeds.' See INHERITANCE, DEBT, MORTGAGE.

Benefit Societies. See FRIENDLY SOCIETIES; and for the associations sometimes called Benefit Building Societies, see BUILDING SOCIETIES.

Benéke, FRIEDRICH EDUARD, professor of philosophy in Berlin, was born in that city in 1798, and studied theology and philosophy, first at Halle, and then at Berlin. In 1820 he commenced lecturing in the latter university, but his lectures were soon interdicted by the minister Altenstein, as his philosophical views were quite opposed to those of Hegel. For three years he taught at Göttingen, but in 1827 his lectures at Berlin were again allowed, and in 1832, on Hegel's death, he was appointed extraordinary professor of philosophy. In March 1854 Benéke disappeared suddenly from his residence, and nothing more was heard of him until June 1856, when his body was found in the canal at Charlottenburg. Benéke has more affinity with British thinkers than any other German philosopher. His most important works are on psychology, which he insists must be founded on the facts of our consciousness. His system of psychology is therefore what the Germans call 'empirical,' and his method is the Baconian as pursued in natural science.

Beneš, EDUARD, Czech statesman, born in 1884, was a lecturer on sociology in Prague University. A refugee during the Great War, he wrote *Bohemia's Case for Independence* (1917). In the first and subsequent Czechoslovak ministries, including his own (1921-22), he was foreign minister. The 'Petite Entente' was his work.

Benet College. See CAMBRIDGE.

Benevento (ancient *Beneventum*), a city of Southern Italy, capital of a Campanian province of the same name, is situated on a hill near the confluence of the Calore and Sabato, 61 miles N.E. of Naples by rail. It occupies the site of the ancient city, out of the materials of which it is entirely built, and is surrounded by walls about 2 miles in circumference. It has a citadel, a fine

old cathedral, some noteworthy churches, and a magnificent arch, erected in 114 A.D. to the honour of the Emperor Trajan, which, with the single exception of that of Ancona, is the best preserved specimen of Roman architecture in Italy. It is an archiepiscopal see, and has a population of about 25,000, chiefly engaged in the manufacture of leather, parchment, and plated goods. The town was in the possession of the Samnites when history first takes notice of it, and it appears to have been captured from them by the Romans some time during the third Samnite war (298-290 B.C.). It was certainly in the hands of the Romans in 274 B.C.; and six years later they changed its name from Maleventum to Beneventum, and made it a Roman colony. The Carthaginians under Hanno were twice decisively defeated in the immediate neighbourhood during the second Punic war. It rapidly rose to be a place of importance under the Roman empire; under the Lombards, who conquered it in the 6th century, it continued to flourish; and at length it became capital of a duchy which included nearly the half of the late kingdom of Naples. This was seized by the Normans; the town was given (1053) to the pope by the Emperor Henry III. Thenceforward, until 1860, when it was united with the kingdom of Italy, Benevento continued, with slight intervals, to be governed through a resident cardinal with the title of Legate. In 1806 it was bestowed by Napoleon, with the title of prince, on Talleyrand; but it was restored to the pope in 1815.—The province of Benevento has an area of 820 sq. m., and a population of 260,000.

Benevolence, in the history of the law of England, was a species of forced loan or contribution, levied by kings without legal authority. It was first so called in 1473, when asked from his subjects by Edward IV. as a mark of good-will towards his rule, but similar compulsory 'free-will offerings' had not been uncommon in former reigns. Under Richard III., in 1484, an act of parliament abolished benevolences as 'new and unlawful inventions,' but spite of this they continued to be exacted by Richard himself and by Henry VII. In 1614 James I. tried, but with little success, to raise money by this expedient, and it was never again attempted by the crown; Charles I. expressly declining to have recourse to it.

Benfey, THEODOR, a great orientalist and comparative philologist, was born of Jewish parents near Göttingen in January 1809. He studied at Göttingen, Munich, Frankfurt, and Heidelberg, devoting himself especially to classical and comparative philology. In 1862 he was appointed to the chair of Sanskrit and Comparative Philology in the university of Göttingen, which he held till his death in June 1881. One of his earliest literary efforts was a translation of Terence (Stutt. 1837); after this, however, he turned his attention almost exclusively to comparative philology, oriental languages, especially Sanskrit, and mythology. In his fifty years devoted with rare enthusiasm and persistency to linguistic studies, he did more than any other scholar to enlarge the boundaries of Sanskrit philology. In comparative philology, though an adherent of Bopp, he deviated from his master in deriving all Indo-European words from *monosyllabic primitive verbs*. This conception depends on his theory of the origin of stem suffixes. These, he holds, are almost all derived from a fundamental form *ant*, which appears in the present participle of verbs. To support this view he assumes the most violent permutations of sounds which set all phonetic laws at defiance. For his theory, see his *Lexicon of Greek Roots* (Berl. 1839), *Short Sanskrit Grammar*

(Lond. 1868), and numerous essays. In Sanskrit he laid a foundation for the true study of the Veda by editing the *Sāma Veda* (Leip. 1848) with glossary and translation; and this work he continued by a scholarly translation of the first *mandala* of the Rig Veda in his magazine *Orient and Occident* (Gött. 1863-64). His Vedic grammar, for which he had been collecting materials for many years, was left unfinished. He also published a *Complete Sanskrit Grammar, Chrestomathy and Glossary* (Leip. 1854), and a *Sanskrit-English Dictionary* (Lond. 1866); and in comparative folklore his principal work was a translation (2 vols. 1859) of the *Panchatantra* (q.v.).

Bengal (old *Bangālā*), a name given to part of British India, but variously signifying—(1) the old historical presidency which, in pre-Mutiny times, comprised the greater portion of Northern India; (2) the province as it was till 1905, also called Lower Bengal, comprising Bengal Proper (the division of Calcutta and four other districts), Bihar, Orissa, and Chota Nagpur; (3) Bengal as partitioned in 1905, when Eastern Bengal was detached and united with Assam; (4) Bengal as repartitioned in 1912 from Bihar and Orissa and reunited with Eastern Bengal. Bengal had 78,699 sq. m. and 46 millions of inhabitants in 1921; while Bihar and Orissa had 83,181 sq. m. and 34 millions. As divided in 1905, Bengal contained 42 millions of Hindus and 9 of Mohammedans; while Eastern Bengal and Assam had 18 millions of Mohammedans and 12 of Hindus.

The undivided province was the largest and most populous of the twelve divisions of British India, nearly as large as Spain, and half as large again as Great Britain and Ireland: its lieutenant-governor had to superintend an area of 151,000 sq. m. and a population of 75 millions—with the native states, 80 millions, or more than that of the United States of America at that time, and about twice that of the United Kingdom. The census of 1881 gave a population of 66,750,520 in British territory and 2,845,405 in the feudatory states. The following are the census figures for 1911 and 1921, giving a density in Bengal Proper of 592 per square mile, in Bengal States 166:

	Sq. miles.	Pop. 1911.	Pop. 1921.
Bengal.....	78,699	45,483,077	46,653,177
Bihar and Orissa.....	83,181	34,490,084	35,993,778
Assam.....	53,015	6,713,635	7,598,861
British Territory.....	214,895	86,686,796	88,250,816
Bengal.....	5,393	822,565	896,173
Bihar and Orissa.....	28,643	3,945,209	3,965,481
Assam.....	8,456	346,222	383,672
Feudatory States.....	42,497	5,113,996	5,245,276
Total.....	257,392	91,800,792	93,496,092

Roughly speaking, Bengal comprises the low-lying deltas of the Ganges and Brahmaputra, and the alluvial plains stretching along their lower courses. In the N. it is hemmed in by the Himalayan ramparts; in the SW. it adjoins the hilly region of Chota Nagpur, which forms a continuation of the Central Indian plateau; while on the S. its coastline extends round the top of the Bay of Bengal, from the Hugli to the point at which Chittagong is terminated by the Lower Burma boundary. Although for the most part level, Bengal is diversified in various parts by peaks and spurs thrown out from the great mountain-systems. It is bounded landwards by the native states of Sikkim and Bhutan on the N., by Assam and Upper Burma on the E., by Nepal and Bihar and Orissa on the W. The province is portioned out into five large administrative tracts called divisions, each under a commissioner, Calcutta (or Presidency), Bardwan, Rajshahi, Dacca, and Chittagong. The divisions, Patna, Tirhut, and Bhagalpur, Orissa, and Chota

Nagpur, form the new province of Bihar and Orissa. The commissionerships are again divided into districts, each with a magistrate, and among these may be named the densely peopled metropolitan districts of Hugli (Hooghly), Howrah, and the 24 Parganas; and the rich trading districts of Dacca and Faridpur. The distinctive features of Bengal are its immense network of rivers, the magnificent range of the Himalayas, the luxuriant but fever-haunted Terai at the base of the great mountain-chain, and the trackless forests and jungles of the Sunderbunds (Sunderbunds), on the sea-face of the delta—the almost undisputed home of the tiger and rhinoceros. Besides the main streams of the Ganges and Brahmaputra, the chief rivers are the Tista, Hugli (formed by the Bhagirathi and Jalangi), the Damodar, and Rupnarayan. All the rivers are subject to floods, bring down an immense quantity of soil, and thousands of square miles in the delta thus receive a splendid top-dressing every year. The country is so enriched by this system of recuperation as 'to defy the utmost power of over-cropping to exhaust its fertility.' As compared with Northern India, Bengal is remarkable for the absence of large cities. Calcutta, the capital, is one of the largest cities in the world, having in 1921 a population of 1,263,292. But the other towns are small, the next largest being Dacca, with 117,000. On the Hugli, within 20 miles of Calcutta, stand the small French settlement of Chandernagore, the Portuguese Hugli, the Dutch Chinsura, and the Danish Serampur. All these are now places of diminished importance, but they give to the river Hugli a peculiar historical significance; all but Chandernagore have been ceded to England, the Danish town as late as 1845.

The climate of the plains is similar to that of the Indian seaboard everywhere—hot and humid. But on the hills every variety of climate is met with, till the perpetual snow-line is reached. The ordinary range of temperature in the plains is from about 52° F. in the cold season, to 103° in the shade in summer. In good European houses the temperature in the hottest months can be kept down to 95°. The hill-station of Darjiling, at an elevation of 6685 feet, has a mean temperature of 54°. In the eastern districts the average yearly rainfall is over 100 inches, while on the hillsides this is greatly exceeded. Calcutta has only 66, Darjiling 126. Bengal is exposed to the heavy sweep of the Monsoon (q.v.), while cyclonic waves and river inundations are frequent, carrying at times terrible havoc far into the low-lying country. At the same time, earthquakes are not infrequent, and have caused widespread destruction of property. The people are mostly employed in agriculture, and among the chief products are indigo, jute, the opium poppy, oil-seeds, many varieties of rice, cinchona, tea, turmeric, pepper, the silk mulberry, cotton, sugar, and innumerable grains, spices, and drugs. Opium is a government monopoly; and cinchona is chiefly grown at the government plantations at Darjiling. The enormous wealth of Bengal lies in its production of articles of commerce. From its position in relation to the interior, a vast traffic passes through Bengal, much of the wheat of the North-west, and the jute and tea of Assam, finding an outlet at Calcutta. Nearly all the foreign trade belongs to Calcutta. The principal exports are opium, rice, jute, oil-seeds, indigo, cotton, wheat, and hides and skins. A large trade is done in gunny-bags, Calcutta in one year exporting over 600 millions of them. In addition to about 5000 square miles of reserved forests, there are in cultivation over 21 million acres under rice, 2 million acres under wheat and other food-grains, and 1½ million acres under oil-seeds; the other principal crops are sugar, indigo, tobacco, cotton,

and tea. Great interest attaches to the cultivation of tea, which rapidly came to hold a front rank among Indian industries. There are about 300 tea-gardens in Darjiling district and the Terai, including Jalpaiguri; the Assam produce also passes through the province. Systematic forest conservancy has done much to check indiscriminate destruction of timber, and to increase the government revenue (from the 'reserved forests').

Bengal has considerable mineral wealth. In Bardwan coal, iron, and copper are worked, but the iron-smelting has hardly been a commercial success. Of many coalfields, the most important is at Raniganj. The seventy jute and cotton mills around Calcutta are even a more striking indication of industry, employing more than 200,000 hands. This new cotton manufacture in some measure takes the place of the old native industry in fine cottons and muslins, almost annihilated by the competition of Lancashire. Lacquer, sugar, ropes and cables, leather, porcelain and stoneware are also amongst the manufactures. The railways include the Darjiling-Himalayan, one of the most wonderful mountain-railways in the world. Several distinct systems of canals provide for conveyance of goods, and irrigate a vast area of land.

Standing far in advance of the rest of India in education, the enlightened classes in Bengal are largely employed in government service. Of some fifty institutions giving university education, most are affiliated to the university of Calcutta. With engineering, normal, industrial, and other schools, there were in all in 1920 more than 50,000 public educational institutions, with about 1,900,000 pupils, besides over 2000 private institutions, with 67,000 pupils. See the articles INDIA and books there cited, CALCUTTA, BRAHMO SOMA, &c.

Including Eurasians, there are upwards of 45,000 Europeans in the province, of whom 28,000 are in Calcutta and its neighbourhood. Of the Europeans, 12,000 are British-born. In Bengal there are also 1060 Armenians, 3000 Chinese (shoemakers and carpenters in Calcutta), 600 Parsis, and 2000 Jews.

Within the province there is a great variety of race, language, religion, and civilisation. A large proportion of the people are of Aryan stock; but no sharp line can be drawn in race between those called Hindus and those reckoned aborigines or non-Aryan, as many low-caste Hindus are wholly aboriginal in blood. There is within the province every degree of civilisation from that of the English-educated, sceptical Hindu gentleman, to the primitive hillman. The new province of Bengal has 20 million Hindus and 24 million Moslem inhabitants, mainly belonging to the upper classes, and 130,000 are returned as Christians. In Bengal Proper the Santals are the most notable aboriginal stock; in the Indian states are the Kolarian or Dravidian Gonds, Kols, and Bhuiyas, as well as Indo-Chinese tribes.

The history of Bengal is merged in that of India. The Mohammedan conquest dates from 1200. The East India Company made its earliest settlements, purely commercial in character, in the first half of the 17th century. The old settlement was the keystone of the British empire in India; and in the opinion of General Chesney (*Indian Polity*) it remained the one part of India which would be worth retaining were the rest to go. Main facts in the strictly provincial history are the Permanent Settlement of the Land Revenue enacted by Lord Cornwallis in 1793, by which the rights of proprietors were defined and secured in perpetuity; and the Tenancy Act of 1885, a supplement to the older measure, intended to protect cultivators. In 1905 Bengal was partitioned into two divisions. In 1912 the partition of 1905 was reversed, and a fresh division made into Bengal and Bihar and

Orissa. Calcutta at the same time ceased to be capital of India. Under the Government of India Act (1919) Bengal became a governor's province, with diarchical government and a partially elected legislative council. See also INDIA.

Bengal, BAY OF, a portion of the Indian Ocean, of the figure of a triangle. Its southern side, drawn from Coromandel to Malacca, so as merely to leave on the right both Ceylon and Sumatra, may be stated at 1200 miles. The bay receives many large rivers—the Ganges and the Brahmaputra on the north, the Irawadi and Salwin on the east, and on the west the Mahanadi—the Godavari, the Kistna, and the Kaveri. On the west coast there is hardly anything worthy of the name of harbour; while on the east there are many good ports—such as Akyab, Gwa, Maulmain, Tavoy River. The islands in the bay are very numerous, and include the Andaman, Nicobar, and Mergui groups. The monsoons prevail over the whole of the north part of the Indian Ocean, of which the Bay of Bengal is a part, and also over the maritime tracts of Bengal itself. See MONSOON.

Bengalese. See WEAVER-BIRD.

Bengali Language, one of the great Aryan vernaculars of India; see INDIA, and Dinesh Chandra Sen's *History of Bengali Language and Literature* (1912).

Bengal Kino. See BUTEA, KINO.

Bengal Light, or BLUE LIGHT, is a brilliant signal-light used at sea in a case of shipwreck, and in ordinary pyrotechny for illuminating a district of country. It is prepared from nitre, sulphur, and the black sulphide of antimony. The materials are reduced to fine powder, thoroughly dried, and intimately mixed in the following proportions by weight: nitre, 6; sulphur, 2; black sulphide of antimony, 1. The mixture constitutes the Bengal light, and when kindled, immediately bursts into rapid and vivid combustion, evolving a brilliant, penetrating, but mellow light. As the fumes evolved during the combustion of the Bengal light contain an oxide of antimony, and are poisonous, the light cannot be used with safety in rooms or enclosed spaces.

Bengal Quince, the fruit of *Ægle marmelos*. See ÆGLE.

Benga'zi, a seaport of North Africa, capital of the district of Cyrenaica, or Barca (q.v.), on the east coast of the Gulf of Sidra; pop. 35,000, including considerable numbers of Maltese, Greeks, Italians, and Jews. The trade is largely with Mediterranean ports, the extensive traffic with the interior having largely passed to Tripoli. Imports include English cottons and woollens, coal and iron. The harbour, which has a lighthouse, is surrounded by reefs, and has been largely silted up with sand. The sponge-fishery on the coast is valuable. When, with Tripoli, this territory was taken by Italy in October 1911, Bengazi was bombarded rather severely. The town is comparatively clean and well built, and possesses a fine bazaar, and several mosques and synagogues, a Catholic church, and a Franciscan monastery. Bengazi is the site of the ancient city of *Hesperis*, which rose to some importance under Ptolemy III., who called it *Berenice*, after his wife. The ruins lie to the north-east of the present town.

Bengel, JOHANN ALBRECHT, a distinguished German theologian and commentator, born at Winnenden, in Württemberg, 24th June 1687. He studied at Tübingen, where, in 1708, he became theological tutor; later in life he held several high offices. He died 2d November 1752. He was the first Protestant author who treated the

exegesis of the New Testament in a thoroughly critical and judicious style. He did good service also in the rectification of the text of the Bible, and was the first to classify the manuscript authorities for the text of the New Testament into families (Asiatic and African). The short notes in his *Gnomon Novi Testamenti* (1742) are invaluable, and have been translated into various languages. They were made much use of by John Wesley in his *Notes on the New Testament*, which forms one of the standards of Wesleyan Methodism. Indeed, Wesley's work may be regarded as little more than an abridged translation from Bengel. An exposition of the Revelation of St John (1740) and a chronological work—the *Ordo Temporum a Principio per Periodos Economicæ Divinæ Historicæ atque Prophetice* (1741)—gained for Bengel, in his time, a great reputation, some regarding him as an inspired prophet, but the majority as a visionary. In these works he calculated, on the basis he supposed to be laid down in the Apocalypse, that the world would endure for the space of 7777½ years, and that the 'breaking loose and the binding of Satan' would take place in the summer of 1836. See the Lives of him by Burk (2 vols. 1831–37) and Wächter (1865), and Reiff's *Bengel und seine Schule* (1882).

Benghazi. See BENGHAZI.

Benguela (also *Benquella*), a province of Angola or Portuguese Western Africa, between the provinces of Loanda on the N. and Mossamedes on the S., the eastern limits of which are not very definitely fixed. It is usually represented as lying between 10° and 15° S. lat. and 12° and 17° E. long. Its surface is generally mountainous, rising from the coast-line inland in a series of terraces; several important rivers flow through it in a north-west direction to the Atlantic. These rivers have numerous affluents, and water is everywhere so plentiful that it may be found by digging two feet beneath the surface. Sulphur, copper, and petroleum are found in the mountains, and also gold and silver in small quantities. The description of flora and fauna given for Angola (q.v.), of which Benguela is a part, of course applies equally to this latter district.—SÃO FELIPE DE BENGUELA, the Portuguese capital of the above region, is situated on a level plain near the sea, backed by a line of hills, in 12° 33' S. lat. It is very unhealthy, and has a straggling appearance. The loss of trade has, moreover, given it an air of desolation. It was a great slave-station at one time, exporting annually 20,000 slaves to Brazil and Cuba. The population is about 2500. Lobito Bay, 20 miles farther north, with a good harbour, and a railway destined to reach Katanga and connect with the general system of African railways, is a progressive port, which bids fair to become the gateway of Central Africa.

Beni', a river of South America, in Bolivia, rises in the La Paz Cordillera of the Andes, at a height of almost 12,000 feet, and collects all the streams that rush down from the mountains between 14° and 18° S. lat. Flowing through the department of its own name, it joins the Mamore, after a course of over 1000 miles, to form the Madeira, one of the largest affluents of the Amazon. The current is very strong, and there are numerous rapids, but the river is traversed by the rafts and canoes of india-rubber collectors and bark-gatherers.

Benicarló, a poor, dirty, walled town of Spain, in the province of Castellón, 84 miles SW. of Tarragona. Pop. about 10,000, who manufacture 'full-bodied' wines for export to Bordeaux, where they are used in cooking clarets for the English market. Fiery brandy and carobs are also exported.

Benicia, a city of California, formerly capital of Solano county and of the state, is situated on the Carquinez Strait, which connects the San Pablo and Suisun bays, 30 miles NE. of San Francisco. It has a commodious harbour. Cement, leather, and flour are manufactured. Pop. 2700. The 'Benicia Boy' was John C. Heenan, the pugilist, who fought in England with Tom Sayers in 1860.

Beni-Hassan, a village of Upper Egypt, on the east bank of the Nile, remarkable for the catacombs excavated in the low hills that rise in this part of the valley. These chambers are about thirty in number, and are supposed to have been used as sepulchres by the principal inhabitants of Hermopolis, a city that stood on the opposite side of the river. Some measure 60 by 40 feet, and pillars, left smooth for hieroglyphics, are cut out of the rock in imitation of the columns that support the roofs of buildings. The sides of the caverns are covered with paintings representing Egyptian customs; and these, although not so artistic as those in the Theban catacombs, are of earlier date.

Beni-Israel ('sons of Israel'), a remarkable settlement, evidently of Jewish origin, existing in the west of India, chiefly in Bombay and some coast towns. They are believed to have reached India from Yemen about the 6th century. They abstain from unclean fish and flesh, keep the great feasts, and have always strictly observed the Sabbath, while they have a distinctly Jewish cast of countenance. Their number is about 5000, mostly artisans, though some are soldiers. They claim to have existed for about a thousand years, and assert that they assumed the name by which they are known because that of Jehudim ('Jews') was hateful to the Mussulmans. Some of them know Hebrew, but Marathi is their ordinary language, and in it they possess some literature. They rarely intermarry with the ordinary Jews. Among them there exists a class, called Kala Israel ('Black Israel'), with which they never intermarry, as the latter are socially much inferior, being either their own descendants by heathen wives, or the offspring of proselytes. A similar distinction exists among the Jews of Cochim. In Bombay an official called *Nassi*, or head, dispenses justice among the Beni-Israel, while the principal authorities in religious matters are the *kajees*; but in the outlying villages these dispose of both ecclesiastical and civil business, with the aid of a council. It should be remembered that the Afghans call themselves Bani-Israel, and claim descent from King Saul.

Benin', a country of Western Africa, lying between the lower Niger and Dahomey. Benin was formerly one of the most powerful kingdoms in West Africa, but it was subsequently broken up into several small states; and now it is all included in the British protectorate of Nigeria—for the most part in the Benin district of the same (organised 1897). The soil is very fertile, producing rice, yams, palms, pepper, plantains, cotton, sugar, &c. The population is dense. The government, customs, and superstitions of Benin are like those of Ashanti. The capital, Benin, is 73 miles inland from the mouth of the Benin River, and has a population of above 15,000. Gato, a harbour lower down the river, is an important centre for the palm-oil trade. Wari or Jaku, 130 miles SE. of Benin, is on an island surrounded by a branch of the Niger. The river Benin is 2 miles wide at its mouth, but has a troublesome bar of mud. Benin was discovered by the Portuguese Alfonso de Aveiro (1486), and a large trade in slaves was carried on. The French Bight of Benin settlements (Porto Novo, Kotonu or Cotonou, Grand Popo, and Agoué) are on the coast of Dahomey.

Benin, BIGHT OF, that portion of the Gulf of Guinea (q.v.) extending from Cape Formosa on the E. to Cape St Paul on the W., a distance of about 390 miles, with a coast-line of 460 miles. Several rivers empty themselves into the Bight of Benin, three of which are accessible to shipping. Palm-oil and ivory are the principal articles of trade at the towns on the coast.

Beni-Suef, a town of central Egypt, capital of a province of the same name, on the right bank of the Nile, about 70 miles SSW. of Cairo. A branch line of railway has been constructed westward to Medinet el Fayum, and the town is the entrepôt of all the produce of the fertile valley of Fayum, and has cotton-mills and alabaster quarries. The population of the province is about 453,000; of the town, 32,000.

Bénitier, the vase or vessel for Holy Water (q.v.) in Roman Catholic churches, known in England as the holy-water font, vat, pot, stone, stock, or stoup. Bénitiers are either movable or fixed; portable ones, commonly of silver, being used in processions; and fixed bénitiers placed near the doors of churches, so that the people may dip their fingers in the water, and cross themselves with it as they enter or leave the church.

Benjamin ('son of the right hand'), the youngest and most beloved of the sons of Jacob. His mother, Rachel, died at his birth, naming the child with her last breath *Benoni* ('son of my pain'), but his father changed this ill-omened name to Benjamin. He was the eponymous founder of one of the twelve tribes of Israel. Its warriors were noted for their skill in archery, and for their cleverness in the use of the left hand. According to the Scripture numeration, the tribe in the desert numbered 35,400 warriors above twenty years of age; and on the entrance into Canaan, 45,600. Its territory, which was small but fertile, lay on the west side of the Jordan, between the tribes of Ephraim and Judah. The chief places were Jericho, Bethel, Gibeon, Gilgal, and Jerusalem, the last of which was on the confines of Judah. In the time of 'the Judges,' the tribe of Benjamin became involved in a war of extermination with the eleven other tribes of Israel, who put to death all the males save 600, who afterwards procured themselves wives by a kind of Sabine rape. Saul, the first king of Israel, was of the tribe of Benjamin, which remained loyal to his son, Ishbosheth. After the death of Solomon, Benjamin along with Judah formed the kingdom of Judah; and on the return from the captivity these two constituted the principal element of the new Jewish nation. The apostle Paul was a Benjamite.

Benjamin OF TUDELA, a Jewish rabbi, was born in Navarre, Spain. He was the first European traveller who gave information respecting the distant East. Partly with commercial views, and partly to inquire into the condition of his dispersed co-religionists, he made a journey, in the years 1159-73, from Saragossa, through Italy and Greece, to Palestine, Persia, and the borders of China, returning by way of Egypt and Sicily. He died in 1173. His itinerary—written in Hebrew, and frequently republished in Latin, English, Dutch, German, and French translations—is occasionally concise and valuable; but, like all early travellers, Benjamin had a greedy ear for the marvellous. His blunders, too, are numerous.

Benjamin, JUDAH PHILIP (1811-84), born at St Croix, West Indies, was the son of Anglo-Jewish parents, who emigrated to the United States, where he practised as a lawyer in New Orleans. He was engaged prominently in politics, serving first with the Whigs, and afterwards with the Democrats. He sat in the United States senate

from 1852 till Louisiana's secession in 1860, and in February 1861 joined Jefferson Davis's cabinet as Attorney-general. He was for a few months Secretary of War, and then acted as Secretary of State until Davis's capture in 1865, when he escaped with some difficulty to England. He was called to the English bar in the following year, became a Q.C. in 1872, and retired from a large practice in 1881. He wrote a *Treatise on the Law of Sale of Personal Property*.

Benjamin Tree. See BENZOIN.

Benkulen. See BENCOELÉN.

Ben Lawers, a Perthshire mountain, flanking the NW. shore of Loch Tay. Easy of ascent, it is rich in alpine plants, and there is a magnificent view from its summit, which is 3984 feet high, or with the cairn (rebuilt in 1878), 4004.

Ben Led'i, a mountain (2875 feet) of Perthshire, $4\frac{1}{2}$ miles W. by N. of Callander. A jubilee cairn was erected on it in 1887.

Ben Lomond, a Scottish mountain in the NW. of Stirlingshire, on the east side of Loch Lomond, $18\frac{1}{2}$ miles N. of Dumbarton. It is 3192 feet high, and consists of mica slate, with veins of quartz, greenstone, and felspar porphyry. The summit is precipitous on the north side, with a gentle declivity on the south-east; it is covered with vegetation to the top. Seen from Loch Lomond, it appears a truncated cone, and from between Stirling and Aberfoyle a regular pyramid. The magnificent view from the top in clear weather includes the whole length of Loch Lomond, with its diversified isles, and wooded and cultivated shores, the rich plains of Stirlingshire and the Lothians, the windings of the Forth, the castles of Stirling and Edinburgh, the heights of Lanarkshire, the vales of Renfrewshire and Ayrshire, the Firth of Clyde, the Isles of Arran and Bute, the Irish coast, Kintyre, and the Atlantic. The north semicircle of the horizon is bounded by Ben Lawers, Ben Voirlich, Ben Ledi, Ben Cruachan, and Ben Nevis, and some of the Perthshire lochs are seen.

Benlowes, EDWARD, poet, born about 1603, studied at St John's College, Cambridge, travelled on the Continent, inherited Brent Hall, Essex, spent his fortune on poets and scholars, and died in poverty at Oxford in 1676. By conversion or upbringing a Roman Catholic, he became an Anglican in later life. His principal work, *Theophila, or Love's Sacrifice* (1652), is 'a very discursive treatise on mystical theology and passions of the soul, followed by an equally discursive comment on the sins of the flesh.' The poem was lavishly illustrated by plates and vignettes, and 'several parts thereof set to fit airs by Mr J. Jenkins.' Partly in Latin, mostly in English, it is written in an awkward stanza, and exhibits the extravagances of 'metaphysical' conceit in their extremest form. See Saintsbury's *Caroline Poets* (vol. i. 1905), and Butler's *Character of a Small Poet*.

Ben Macdhu'i, a mountain (4296 feet) of south-west Aberdeenshire, 18 miles WNW. of Castletown-of-Braemar. One of the Cairngorms, it is not a conspicuous summit, but was formerly thought to be higher than Ben Nevis, which alone in Scotland outtops it.

Bennett, (ENOCH) ARNOLD, was born in 1867 in the district of Shelton, north-east of Hanley, one of 'The Five Towns' in north Staffordshire, scene of many of his best works. Abandoning law for literature by way of journalism, he revealed from the close of the 19th century remarkable versatility in a series of works ranging from short stories to a lengthy trilogy; from breathless extravaganzas to grim, slow-moving novels à la Flaubert and the

realists; from comedies rippling with laughter and spiced with satire to Biblical drama—not to mention essays in *belles lettres* largely of a journalistic character. Mr Bennett courted and won popularity in his sensational stories and fantasias—such as *The Grand Babylon Hotel* (1902), *The Gates of Wrath*, and *Buried Alive* (1908); dramatised in 1911 with striking success as *The Great Adventure*. This popularity was confirmed by the breezy humour of *The Card* (1911) and other stories depicting the lighter side of life in the Potteries district, and by the comedy *What the Public Wants* (1909), with its biting satire on the catchpenny press. But it is to his realistic novels that Mr Bennett owes his enduring place in literature—to the drab, yet penetrating, pictures of 'The Five Towns' in *The Old Wives' Tale* (1908), *Clayhanger* (1910), and its sequels *Hilda Lessways* (1911) and *These Twain* (1916); and to the artfully objective *The Pretty Lady* (1918). Much autobiographical material is contained in his *The Truth about an Author* (1903; revised edition, 1914) and other treatises on life and literature—his set of 'Pocket Philosophies.'

Bennett, JAMES GORDON (1795–1872), born near Keith, in Banffshire, and trained for the Roman Catholic priesthood, emigrated to America in 1819, where he became in turn teacher, proof-reader, journalist, and lecturer. On 5th May 1835 he issued the first number of the *New York Herald* as an independent newspaper, and laid the foundation of its enormous success.—His son, JAMES GORDON BENNETT (1841–1918), showed like enterprise in the conduct of the *Herald*. He sent Stanley (q.v.) in 1870 to find Livingstone, and, with the *Daily Telegraph*, financed his Congo journey (1874–78). He supported polar exploration, storm warnings, and automobilism.

Bennett, JOHN HUGHES, an eminent physician, born in London, 31st August 1812, graduated at Edinburgh in 1837, and after four years' study in Paris and Germany, settled in Edinburgh as an extra-mural lecturer. A work published in 1841, in which he recommended cod-liver oil in all consumptive diseases, first brought him into notice, and in 1848 he was made professor of the Institutes of Medicine in Edinburgh University—a post which he held until 1874. His health gave way in 1871, and most of his last years were spent abroad. He died at Norwich, 25th September 1875. His original investigations are embodied in numerous treatises and articles in medical journals, and in his *Text-book of Physiology* (Edin. 1870–71).

Bennett, WILLIAM, born in 1804, graduated B.A. at Oxford in 1837, and, taking orders, was incumbent of Portman Chapel, and of St Paul's, Knightsbridge. The latter charge he resigned in 1851, in consequence of an anti-Tractarian outcry; but he was almost immediately presented to the vicarage of Frome in Somersetshire. An extreme High Churchman, he was author of many theological works, but is chiefly remembered through the case of *Sheppard v. Bennett* (1870–72), wherein his teaching on the Real Presence was pronounced to be not inconsistent with the doctrine of the Church of England. He died 15th August 1886.

Bennett, SIR WILLIAM STERNDALÉ, Mus. D., D.C.L., English pianist and composer, was born at Sheffield, 13th April 1816. After studying for ten years at the Royal Academy, London, he was sent to complete his musical education at Leipzig. He attracted the notice of Mendelssohn at the Düsseldorf Musical Festival, appeared with success at Leipzig in the winter of 1837–38, and was received with great applause when he returned to London. In 1838 he was elected member of the Royal Society of Music, and in 1856 became professor of Music at Cambridge. At the opening of the International

Exhibition, 1862, Tennyson's ode, *Uplift a Thousand Voices*, was sung to music by Bennett. In 1868 he became principal of the Royal Academy of Music, and was knighted in 1871. He died 1st February 1875, and was buried in Westminster Abbey. His published compositions include a symphony, four concert overtures, the two cantatas *The May Queen* and *The Woman of Samaria*, and a few songs. But his peculiar individuality is best exemplified in his works for the pianoforte, of whose capabilities he was a great master; of these, the principal are four concertos and a capriccio with orchestra, two sonatas, and numerous studies. His music is characterised by graceful fancy and delicate finish in the minutest details, rather than commanding power or depth of feeling. His earlier works resemble Mendelssohn's, but a better parallel for the genius of his music generally has been pointed out in Scarlatti, his favourite master in pianoforte music. In his later years his creative activity was almost sunk in that of the teacher. Cordially recognised by Mendelssohn and Schumann, he remained till lately almost the sole representative of English music at all widely known on the Continent. See the Life by his son (1908).

Ben Nevis, a mountain of Inverness-shire, 7 miles SE. of Fort William, by a carriage-road opened in 1880. The loftiest summit in Great Britain, it has a height of 4406 feet, with a tremendous precipice of 1500 feet on the north-east side. Granite and gneiss form the base of the mountain, which above is composed of porphyry. A meteorological observatory was erected on the summit in 1882, and constant observations were made and communicated by telegraph; but both this and the associated low-level observatory in Fort William (opened in 1890) were closed in 1904 for want of adequate support.

Bennigsen, LEVIN AUGUST THEOPHIL, COUNT, a general in the Russian service, was born at Brunswick in 1745, and having entered the Russian service in 1773, soon attracted the notice of the Empress Catherine, who employed him to carry out her designs against Poland. He fought at Pultusk (1806), and held the chief command in the murderous struggle at Eylau (1807). When Napoleon invaded Russia in 1812, Bennigsen commanded the Russian centre on the bloody field of Borodino. Before the French began their retreat, he gained a brilliant victory over Murat at Tarutino (October 18). Differences with Kutusov made him retire for a time from the service; but after that general's death, he took the command of the Russian army of reserve, fought victoriously at the battle of Leipzig, and was created count by the Emperor Alexander on the field. Failing health made him retire finally, in 1818, to his paternal estate in Hanover, where he died in 1826.

Bennington, a town of Vermont, 37 miles NE. of Troy, N.Y., has woollen and iron manufactures. It was the scene of an American victory in 1777. Pop. 10,000.

Benoît de Sainte-More, French trouvère of the latter half of the 12th century, wrote a lengthy *Roman de Troie* (ed. L. Constans, 1906 *et seq.*), and probably (for Henry II. of England) a *Chronique des Ducs de Normandie*. Other romances have been doubtfully assigned to him.

Benoni, a gold-mining town of the Transvaal, 20 miles E. of Johannesburg; pop. 47,500 (14,500 white).

Benshie. See BANSHEE.

Benson, EDWARD WHITE (1829–96), Archbishop of Canterbury, born near Birmingham, took a first at Cambridge, senior optime, was a master at Rugby, and first head-master of Wellington

College. In 1876 he was nominated to the newly erected bishopric of Truro, and in 1882 was translated to Canterbury. He published several volumes of sermons, and works on Cathedrals and on St Cyprian, and gave the important judgment in the Lincoln case on ritual. See the Life by his eldest son, A. C. BENSON (b. 1862), Master of Magdalene College, who has published poems, essays, books on Laud, Tennyson, Rossetti, FitzGerald, Pater, and Ruskin, and on his brother Hugh, and (with Lord Esher) edited Queen Victoria's correspondence, 1907. The article on Matthew Arnold in this work is from his pen. His third son, EDWARD FREDERIC (b. 1867), is author of *Dodo* (1893), *The Rubicon*, *The Babe B.A.*, *Vintage*, *The Angel of Pain*, and many other novels and plays. A younger son, ROBERT HUGH (1871-1914), became a Roman Catholic priest, a popular preacher, and private chamberlain to Pope Pius X. He wrote *The Light Invisible* and other novels, and some theological works. See Life by Martindale (1916).

Benson, RICHARD MEUX (1824-1915), founder and first Superior (1866-1890) of the Society of Mission Priests of St John the Evangelist, commonly called the Cowley Fathers. He studied at Oxford, was vicar of Cowley in 1850-70, and of Cowley St John (then separated) in 1870-86. He wrote sermons and devotional books. See his *Letters* (1916-20). The Cowley Fathers are an Anglican monastic society 'for the cultivation of a life dedicated to God according to the principles of poverty, chastity, and obedience.' Its headquarters are at Cowley St John, near Oxford. The fathers, who are employed in educational and missionary work, wear a black cassock with a black cord and a long black cloak.

Bent Grass (*Agrostis*), a genus containing about a hundred species (see GRASSES, PASTURE).—Common Bent Grass (*A. vulgaris*), abounding on dry elevated lands, becomes a pest in arable land. *A. canina* is also common.—Marsh Bent Grass (*A. alba*) is found in moist situations, and a variety (*A. stolonifera*) is known as Florin Grass. *A. dispar*, American Herd Grass, or Red Top Grass, is cultivated in France. The rarer and more delicate *A. spica-venti* is chiefly admired for its graceful appearance. Most of the European species are North American also. In the United States and Canada some of the bents are highly important as pasture and forage plants. On suitable soils *A. vulgaris* and *alba* give excellent crops of hay.

Bentham, GEORGE, botanist, nephew of the jurist, was born in 1800 at Stoke, a village since absorbed in Portsmouth. The son of an officer who had risen to high rank in both the Russian and English services, young Bentham's earlier years were spent largely abroad, but from 1826 to 1832 he lived with his uncle, to whom he acted as secretary while carrying on his own legal studies. His *Outlines of a New System of Logic* (1827) is a remarkable book; herein for the first time is clearly set forth the doctrine of the quantification of the predicate, in which he thus anticipated Sir William Hamilton. Only sixty copies, however, were sold when the publishers became bankrupt; and the fact that the work contained this discovery was not recognised until 1850, although Bentham's claims have been fully vindicated since. Though called to the bar, he soon abandoned the law for botany. He had catalogued the plants of the Pyrenees (1824-26), and had been elected in 1828 a Fellow of the Linnæan Society, and in 1829 secretary of the Horticultural Society. He now devoted himself to his new study, and soon published his important *Labiatarum Genera et Species* (1832-36). In 1854 he presented his collections to the Royal Gardens at Kew, where for the rest of

his life he was engaged almost every day in his task of systematisation and description. He there elaborated the flora of Hong-Kong and of Australia, and in conjunction with Sir Joseph Hooker, completed his exhaustive and valuable *Genera Plantarum* (3 vols. 1862-83), which may be said to summarise the botany of flowering plants. His numerous other writings did much to elucidate the flora of almost every region outside the Arctic circle. He died 10th September 1884. From 1863 to 1874 president of the Linnæan Society, Bentham was a member of many other British and foreign learned bodies, and in 1878, on the completion of the Australian flora, received a Companionship of St Michael and St George. See a book on him by B. D. Jackson (1906).

Bentham, JEREMY, writer on jurisprudence and ethics, was the son of a pushing attorney in London, where he was born (in Red Lion Street, Houndsditch) on 15th February 1748. At the age of seven he was sent to Westminster School; and in 1760, being only twelve years old, he entered Queen's College, Oxford, where he took his B.A. degree in 1763. But though his years were so tender, he appears to have been less unprepared than might be supposed to benefit by the university; for before entering it, he had already, by his precocious tendency to speculation, acquired the title of 'the philosopher.' His father, who expected him to become Lord Chancellor, set him to study law at Lincoln's Inn, where he was called to the bar in 1772. He never practised, however, having a strong distaste for his profession, which is paraded in many of his writings. Turning from the practice of law to its theory, he became the greatest critic of legislation and government in his day. His first publication, *A Fragment on Government* (1776), was an acutely hypercritical examination of a passage in Blackstone's *Commentaries*, prompted, as he has himself explained, by 'a passion for improvement in those shapes in which the lot of mankind is meliorated by it.' The *Fragment* abounds in fine, original, and just observation; it contains the germs of most of his after writings, and must be highly esteemed, if we look away from its disproportion to its subject and the writer's disregard of method. It procured him, in 1781, the acquaintance of Lord Shelburne (Lansdowne), at whose seat, Bowood, he afterwards passed perhaps the most agreeable hours of his life. Here it was that he met Miss Caroline Fox (Lord Holland's sister), who was still a young lady, when Bentham, in 1805, offered her his heart and hand, and was rejected 'with all respect.'

On the death of his father in 1792, he succeeded to property in London, and to farms in Essex, yielding from £500 to £600 a year. He lived frugally, but with elegance, in Queen Square, Westminster; and employing young men as secretaries, got through an immense amount of work and correspondence. By a life of temperance and great self-complacency, in the society of a few devoted friends ('who,' says Sir James Mackintosh, 'more resembled the hearers of an Athenian philosopher than the proselytes of a modern writer'), he attained the age of eighty-four, dying 6th June 1832. In accordance with his own directions, his body was dissected; and his skeleton, dressed in his accustomed garb, is preserved at University College, London.

A pamphlet on *The Hard Labour Bill* (1778), recommending an improvement in the mode of criminal punishment, was an excerpt from his *Rationale of Punishments and Rewards* (1825), which was written in 1775, but first saw the light in a French translation by Dumont (1811). In these two works, Bentham did more than any other writer of his time to rationalise the theory

of punishments by consideration of their various kinds and effects, their true objects, and the conditions of their efficiency. He published in 1787 *Defence of Usury*; in 1789, *Introduction to the Principles of Morals and Legislation*; in 1802, *Discourses on Civil and Penal Legislation*; in 1813, *A Treatise on Judicial Evidence*; in 1817, *Paper relative to Codification and Public Instruction*; in 1824, *The Book of Fallacies*. His works were collected and edited in 1843 by Bowring and John Hill Burton, in 11 volumes. It is well, however, for Bentham's reputation, that it does not rest wholly on his published writings; and that he found in Dumont, the Mills, and Sir Samuel Romilly, generous disciples to diffuse his principles and promote his fame. In his early works, his style was clear, free, spirited, and often eloquent; but, from 1810, it became overloaded and darkened with technical terms. It is in regard to these more especially that M. Dumont has most materially served his master by arranging and translating them into French, through the medium of which language Bentham's doctrines were propagated throughout Europe, till they became more popular abroad than at home. James Mill, himself an independent thinker, did much in his writings to extend the application in new directions of Bentham's principles, a work in which, apart from his original efforts, he achieved a lasting monument of his own subtlety and vigour of mind.

In all Bentham's ethical and political writings, the doctrine of utility is the leading and pervading principle. His favourite vehicle for its expression, 'the greatest happiness of the greatest number,' a phrase first formulated by Hutcheson and taken over by Beccaria and Priestley, owes its currency to Bentham. 'In this phrase,' he says, 'I saw delineated for the first time a plain as well as a true standard for whatever is right or wrong, useful, useless, or mischievous, in human conduct, whether in the field of morals or politics.' In the application of the principle Bentham arrived at various conclusions, which he advocated irrespective of the conditions of society in his day, and of the laws of social growth, which, indeed, neither he nor his contemporaries understood. He demanded nothing less than the immediate remodelling of the government, and the codification and reconstruction of the laws; and insisted, among other changes, on universal suffrage, annual parliaments, vote by ballot, and paid representatives. Many of his schemes have been realised, many more are in course of realisation; the end and object of them all was the general welfare, and his chief error lay in conceiving that organic changes are possible through any other process than that of growth and modification of popular needs, ideas, and institutions. It was this error that led the philosopher, in his closet in London, to devise codes of laws for Russia (through which country he made a tour in 1785) and America, the adoption of which would have been equivalent to revolutions in these countries, and then bitterly to bewail the folly of mankind when his schemes were rejected. But in Mill's words, 'he found the philosophy of law a chaos, and left it a science.' He may be regarded as the philosophic pioneer of Liberalism and Radicalism, and holds a high place in the history of political thought.

See J. H. Burton's *Benthamiana* (1843), the Life in Bowring's edition of his works, that by C. M. Atkinson (1905), and the articles MILL (J. S.), UTILITARIANISM, &c.

Benthamia, a sub-genus of Cornaceæ (q.v.) in which the many small drupes grow together. *Benthamia fragifera*, a native of Nepal, is a small tree, with lanceolate leaves, fragrant flowers, and a reddish fruit, not unlike a mulberry, but larger; not unpleasant to the taste. Its fruit has been known to ripen in the south of England.

Bentinck, WILLIAM, first Earl of Portland, born in Holland in 1649, was the descendant of a noble family which in the 14th century had migrated from the Palatinate to Gelderland, where it is still represented by a younger line. He was from boyhood the favourite and friend of William III., and was founder of the fortune of the Bentinck family in England. He was constantly employed, both in military and diplomatic services, and trusted beyond all others with the secrets of the king's foreign policy. After the coronation of William and Mary, Bentinck was created an English peer, and presented with large estates and numerous offices in the royal household; but these last he resigned in 1699, from jealousy of Arnold van Keppel, Earl of Albemarle. The king's affection, however, never wavered to the end of his life, and his last audible words were an inquiry for his favourite. Bentinck died in 1709.—WILLIAM CAVENDISH BENTINCK, third Duke of Portland, born in 1738, entered Lord Rockingham's cabinet in 1765, and succeeded him as leader of the Whig party. He was twice prime-minister—April to December 1783, and 1807-9; but his best work was done as Home Secretary under Pitt, with charge of Irish affairs, throughout the eventful period 1794-1801. He died a month after resigning the premiership, November 30, 1809.—LORD WILLIAM CAVENDISH BENTINCK, Indian statesman, second son of the third Duke of Portland, was born in 1774, and became an ensign in the Coldstream Guards in 1791. Having served with distinction in Flanders and Italy, he was governor of Madras (1803-7), where he advocated several useful reforms; but his proscription of sepoy beards and turbans led to the massacre of Vellore, and his own immediate recall. From 1808 to 1814 he was serving in the Peninsula and Italy; in 1827 he was appointed governor-general of Bengal, and in 1833 became the first governor-general of India. His policy in India was pacific and popular, and his viceroyship was marked by the suppression of suttee and thuggism, the educating and employment of natives, the opening up of the internal communication, and the establishment of the overland route. He returned to England in 1835, and died at Paris, June 17, 1839. See a Life by Boulger (1892).

LORD GEORGE BENTINCK, sportsman and leader of the Protectionists, the third son of the fourth Duke of Portland, was born 27th February 1802, and, entering the army in 1819, attained six years afterwards the rank of major. From 1822 to 1825 he was private secretary to his uncle, Mr Canning, and in 1826 was elected member for Lynn-Regis. At first, attached to no party, he voted for Catholic emancipation and for the principle of the Reform Bill, but against several of its most important details, and in favour of the celebrated Chandos clause. On the formation of Peel's ministry in December 1834, he and his friend Lord Stanley, afterwards Earl of Derby, with some adherents, formed a separate section in the House of Commons; but, on Peel's resignation in the following April, Lord George openly joined the Conservative party, and in 1841 received from Peel an offer of office, which he declined, being at that time too deeply engrossed in racing and field-sports. When Peel introduced his free-trade measures in 1845, a large body of his supporters formed a Protection party, Lord George assuming its leadership, and taking henceforth a prominent part in the debates. A hard hitter, and a master of figures, he was no orator; yet his speeches in the session of 1846 were most damaging to the government of Sir Robert Peel, and contributed in no small degree to hasten its downfall. He was always a champion of religious liberty, advocating the removal of the Jewish disabilities, and the endowment of the Irish Catholic

clergy out of the land; and at the time of the potato famine he wanted government to lend £16,000,000 for reproductive works in Ireland. He was an 'Admirable Crichton' of field-sports, and though he never did win the Derby, had brilliant success on the turf, whose dishonest practices he showed the utmost zeal to suppress. He died suddenly, 21st September 1848, whilst walking near Welbeck Abbey. See his *Life* by Lord Beaconsfield (1851), and his *Racing Life* by Kent (1892).

Bentley, RICHARD, scholar, was born of yeoman parentage at Oulton, in the West Riding of Yorkshire, January 27, 1662. After four years at Wakefield grammar-school, he entered St John's College, Cambridge, in 1676, as subsizar. Little is known of his university career, except that he showed early a strong taste for the cultivation of ancient learning. At the usual time, he took the degree of Bachelor of Arts; and in 1682 he was appointed by his college to the head-mastership of Spalding grammar-school, in Lincolnshire. Within the year he resigned this situation to become tutor to the son of Dr Stillingfleet, then Dean of St Paul's, and subsequently Bishop of Worcester. In 1689 he accompanied his pupil to Oxford, where he had full scope for the cultivation of classical studies; and that he succeeded in acquiring there some local reputation is evinced by his having been twice appointed to deliver the Boyle Lectures on the Evidences of Natural and Revealed Religion. He had taken orders in 1690, and to Stillingfleet he owed various good ecclesiastical preferments, with the post of librarian of the King's library at St James's. His *Letter to Mill* (1691) on the chronicler John Malelas is itself a masterpiece; but it was the *Dissertation upon the Epistles of Phalaris* (1699), an expansion of an earlier essay, that established his reputation throughout Europe, and may be said to have commenced a new era in scholarship. The principles of historical criticism were then unknown, and their first application to establish that the so-called Epistles of Phalaris (q.v.), which professed to have been written in the 6th century B.C., were the forgery of a period some eight centuries later, filled the learned world with astonishment.

In 1700 Bentley was appointed Master of Trinity College, Cambridge; and in the following year he married Joanna Bernard, the daughter of a Huntingdonshire knight. The history of Bentley's Mastership of Trinity is the narrative of an unbroken series of quarrels and litigations, provoked by his arrogance and rapacity, for which, it must be confessed, he was fully as well known during his lifetime as for his learning. He contrived, nevertheless, in 1717, to get himself appointed regius professor of Divinity, and, by his boldness and perseverance, managed to pass scathless through all his controversies. Notwithstanding that in 1714 one Bishop of Ely, the visitor of Trinity, was hindered only by death from pronouncing sentence depriving him of his mastership, that in 1718 the university senate deprived him of his degrees, and that in 1734 another bishop did actually pronounce his deposition, he was in full possession of both mastership and degrees at the time of his death. This stormy life did not impair his literary activity. He edited various classics—among others, Horace (1711) and Terence (1726)—upon which he bestowed vast labour. Emendations were at once his forte and foible—the latter conspicuously in his edition of *Paradise Lost* (1732). He is, perhaps, more celebrated for what he proposed than for what he actually performed. The proposal (1720) to print an edition of the Greek New Testament, in which the received text should be corrected by a careful comparison with the Vulgate and all the oldest

existing Greek MSS., was then singularly bold, and evoked violent opposition. He failed in carrying out his proposal; but the principles of criticism which he maintained have since been triumphantly established, and have led to important results in other hands, as in Lachmann's. He is to be regarded as the founder of that school of classical criticism of which Porson afterwards exhibited the chief excellences as well as the chief defects; and which, though it was itself prevented by too strict attention to minute verbal detail from ever achieving much, yet diligently collected many of the facts which men of wider views are still grouping together to form the modern science of comparative philology. Bentley died 14th July 1742, leaving behind him one son, Richard, who inherited much of his father's taste with none of his energy, and two daughters, one of whom, Joanna, married, and was the mother of Richard Cumberland the dramatist. See Monk's *Life of Bentley* (2 vols. 1833); Jebb's *Bentley* (1882); and Dyce's unfinished edition of his works (3 vols. 1836-38).

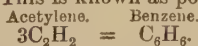
Benton, THOMAS HART, an American statesman, born in North Carolina in 1782, settled in Tennessee, where he studied law, and was elected to the legislature. In 1812 he raised a regiment of volunteers, and also served on General Jackson's staff. After the war, he started a newspaper in St Louis, by which he became involved in several duels. On the admission of Missouri as a state, he was chosen United States senator in 1820, and in this post, during thirty years' continuous service, took a leading part in public affairs. He died in Washington, April 10, 1858. A determined opponent of Calhoun's nullification scheme, he afterwards supported Jackson in his war on the United States bank, and earned the sobriquet of 'Old Bullion' by his opposition to the paper currency. He published *A Thirty Years' View, or a History of the Working of the American Government from 1820 to 1850* (2 vols. 1854-56); and *An Abridgment of the Debates of Congress from 1789 to 1856* (15 vols. 1857).

Benuë (spelt also *Binuë* and, by Dr Barth, *Benuwé*), an important river of Central Africa, forming the great eastern affluent of the Niger, which it joins about 230 miles above the mouth of that river in the Gulf of Guinea. Dr Barth describes the Benuë as being 800 yards across, with a general depth in its channel of 11 feet, and 'a liability to rise under ordinary circumstances at least 30 feet, or even at times 50 feet higher.' In 1854 an expedition under the command of Dr Baikie explored it as far as Dulti, a place about 350 miles above its confluence with the Niger. In a second expedition, undertaken in 1862, Dr Baikie explored as far north as Kano, in Haussa. The Church Missionary Society sent out an exploring party in 1879 under Flegel, who in 1883 reached its sources in Adamawa; and Mizon's expedition in 1892 greatly extended our knowledge of it. Flowing through wide tracts of fertile territory, and navigable for 700 miles, the Benuë is a highway into the heart of the Sudan, and is evidently destined to be an important channel of commerce with Central Africa.

Benyowsky, MAURICE AUGUSTUS, COUNT DE, a remarkable Hungarian adventurer, born in 1741. While fighting for the Polish Confederation, he was taken prisoner in 1769, and banished to Kamchatka, where he was made tutor in the family of the governor. In this capacity he gained the affections of the daughter of the governor, by whom he was assisted in his plans for escape; which, however, was not effected without a struggle, in which the governor was killed. Benyowsky, with ninety-six companions, set sail in a ship well armed and provisioned, and with a considerable amount of

treasure, and reached France in 1772. Invited by the French government to found a colony at Madagascar, he arrived on the island in February 1774, and was made king in 1776 by the chiefs in conclave, he adopting the native costume. His relations with the French were now not always friendly, and while in contention with the government of Mauritius, he was killed in battle, May 23, 1786. See *Memoirs and Travels of Benyowsky, written by Himself* (1790; new ed. by Pasfield Oliver, 1904).

Benzene, a compound of carbon and hydrogen, C_6H_6 , discovered by Faraday in 1825, in a tarry liquid resulting from the distillation of oil. It must not be confounded with Benzine or Benzoyl, which names have at different times been used for benzene. *Benzine* is the name given to a distillate from American petroleum, which is much used as a substitute for turpentine, and for dissolving oils and fats. *Benzoyl* is the commercial name applied to a mixture of substances, including benzene and its homologues. *Benzol* is synonymous with benzene, while *benzoline* is a name applied to benzene and impure benzene indiscriminately. Benzene is found amongst the products of the destructive distillation of a great many organic bodies. The most abundant source of benzene is coal-tar (see GAS, COAL). On distilling coal-tar, the more volatile liquid hydrocarbons pass over first, mixed with acid and basic compounds, and constitute what is known as light oil or coal naphtha. When the crude naphtha is purified by redistillation and subsequent agitation, first with sulphuric acid, and then with caustic soda, an oil is obtained which consists mainly of benzene and its homologues. By submitting this oil to a process of fractional distillation, a portion is obtained, boiling at 176° – 212° (80° C.– 100° C.), from which benzene crystallises out on cooling the liquid to 32° (0° C.). The benzene is freed by pressure from the substances remaining liquid at this temperature. Commercial benzene is, however, always impure. Pure benzene is most readily obtained by cautiously distilling a mixture of one part benzoic acid with three parts of slaked lime. The mixture of benzene and water which passes over is shaken up with a little potash, the benzene decanted, treated with calcium chloride to take up the water, and the dried benzene thus obtained is rectified on the water-bath. At ordinary temperatures benzene is a thin, limpid, colourless liquid, evolving a characteristic and pleasant odour. At 41° F. (5° C.) it solidifies; and at 176° F. (80° C.) it boils, evolving a gas which is very inflammable, burning with a smoky flame. It readily dissolves in alcohol, ether, turpentine, and wood-spirit, but is insoluble in water. It is valuable to the chemist from the great power it possesses of dissolving rubber, gutta-percha, wax, camphor, and fatty substances. Impure benzene is thus much used in removing grease-stains from woollen or silken articles of clothing. When heated, benzene also dissolves sulphur, phosphorus, and iodine. Commercially of importance, benzene is from the chemical point of view a compound of surpassing interest. It consists of 12 parts of carbon by weight, with 1 part of hydrogen, and might therefore be represented by the formula CH ; but it has been found that the molecule weighs six times as much as this, and requires the formula C_6H_6 . Benzene has been synthesised by Berthelot by heating acetylene in a closed retort. This is known as polymerisation.



The manner in which the atoms are arranged in the molecule has already been referred to in the article on the Aromatic Series, and it will be seen by a reference to the graphic formula there given that the number of compounds derivable from benzene

is practically unlimited. The so-called coal-tar colours are all derivatives of benzene (see DYE-ING, and ANILINE).

Benzerta. See BIZERTA.

Benzoic Acid, or the *Flowers of Benzoïn*, has been known since the beginning of the 17th century, and occurs naturally in many balsamiferous plants, and especially in benzoïn gum, from which it may be readily obtained by several processes. The simplest is as follows: The coarsely powdered resin is gently heated in a shallow iron pot, the mouth of which is closed by a diaphragm of coarse filter-paper. Over this is tied a covering of thick paper somewhat like a hat. The porous filter-paper allows the vapours of benzoic acid to pass through it, but keeps back the empyreumatic products. At the end of the operation, the hat-like cover is found lined with a crystalline sublimate of benzoic acid which is nearly pure, being mixed only with traces of a volatile oil, which gives it a pleasant smell, like vanilla. The benzoic acid thus prepared is the best for pharmaceutical purposes. Benzoic acid is also prepared from the urine of graminivorous animals, but has a slight urinous odour. The acid is manufactured cheaply by synthetic methods, toluene or naphthalene being used as starting-point. The acid obtained from the latter is frequently resublimed with benzoïn to give it a vanilla-like odour. Benzoic acid is always in the form of snow-white, glistening, feathery crystals, with a fairy aspect of lightness, having a warm, acrid, acidulous taste. It is readily dissolved by alcohol and ether, but sparingly soluble in water, which, however, dissolves it readily on the addition of borax or phosphate of soda. It is one of the materials present in *Tinctura Camphoræ Composita*, and has been administered in chronic bronchial affections, its value being due to its locally stimulating properties. It has also been used largely in genito-urinary diseases. Benzoic acid taken into the stomach increases within three or four hours the quantity of hippuric acid in the urine. Benzoic acid and the benzoates are much used in antiseptic preparations. The chemical formula for crystallised benzoic acid is C_6H_5COOH . Oil of bitter almonds is the aldehyde of benzoic acid (see ALDEHYDES), and the corresponding alcohol, benzoic or benzylic alcohol, is also known.

Benzoïn, BENJAMIN, or BENZOIC GUM, a fragrant resinous substance, formed by the drying of the milky juice of the Benzoïn or Benjamin Tree (*Styrax*, or *Lithocarpus benzoïn*), a tree of the natural order Styracaceæ, and a congener of that which produces Storax (q.v.), a native of Siam, and of Sumatra and other islands of the Indian Archipelago. Benzoïn is first mentioned by Batuta in 1350 A.D. as Java Frankincense (Arabic *Lubân Jawi*), corrupted into Banjawi, Benjoin, Benzoë, &c. Benzoïn comes to us in reddish-yellow transparent pieces. Different varieties, said to depend upon the age of the trees, are of very different price; the whitest, said to be the produce of the youngest trees, being the best. Amygdaloidal benzoïn contains whitish almond-like tears diffused through its substance. Benzoïn is obtained by making longitudinal or oblique incisions in the stem of the tree: the liquid which exudes soon hardens by exposure to the sun and air. Benzoïn contains about 14 to 18 per cent. of Benzoic Acid (q.v.), although in some varieties this is either entirely wanting or replaced by 11 per cent. of cinnamic acid. A very fragrant oil, *styröl*, is present in small proportion (a few drops from a pound), the bulk of the gum consisting of resin. Benzoïn is used in perfumery, in pastilles, and for incense, being very fragrant and aromatic, and

yielding a pleasant odour when burned. Its compound tincture is prepared by macerating benzoïn, along with storax, tolu, and aloes, in rectified spirit for seven days, and subsequent straining, when the Compound Tincture of Benjamin (called variously Wound Balsam, Friar's Balsam, the Commander's Balsam, or Jesuit's Drops) is obtained. It is frequently applied to wounds directly; or is used as an exterior varnish over a bandage. In the preparation of court-plaster, sarcenet (generally coloured black) is brushed over with a solution of isinglass, and then with a coating of the alcoholic solution of benzoïn. The tincture is likewise used in the preparation of soaps and washes. Benzoïn possesses stimulant properties, and was formerly much used in medicine, particularly in chronic pulmonary affections. The name *Asa dulcis* (q.v.) was given to it in the 16th century.—The milky juice of *Terminalia benzoïn*, a tree of the natural order of Combretaceæ, becomes, on drying, a fragrant resinous substance resembling benzoïn, which is used as incense in the churches of Mauritius. It was erroneously supposed that benzoïn was the produce of *Benzoïn odoriferum*, or *Lindera benzoïn*, a deciduous shrub of the Lauraceæ, a native of Virginia, about 10 to 12 feet high, which still bears the name of Benzoïn, or Benjamin Tree, and is also called Spicewood or Fever-bush. Its highly aromatic bark is stimulant and tonic, and is used in North America in intermittent fevers. The berries are also aromatic and stimulant.

Benzol. See BENZENE.

Benzoyl, the radical of the benzoic series, represented by the formula C_6H_5O , is a hypothetical substance supposed to exist in benzoic acid and many other bodies. Thus, benzoic acid, from this point of view, is regarded as hydrate of benzoyl, C_6H_5OOH , and the oil of bitter almonds as the hydride of benzoyl, C_6H_5OH . As further examples of this group of bodies, we may mention benzoyl chloride, C_6H_5OCl , and benzoyl cyanide, C_6H_5OCN . *Dibenzoyl* (C_6H_5O)₂, or benzoyl, as it is sometimes called, may be looked on as the above-mentioned radical in the free state, and is prepared by the action of sodium amalgam on benzoyl chloride, in small colourless prisms, soluble in alcohol and ether.

HYDRIDE OF BENZOYL is the volatile or essential oil belonging to the benzoic series. It is represented by the formula C_6H_5OH , and has been already considered under ALMONDS, VOLATILE OIL or ESSENTIAL OIL OF (q.v.).

Beowulf, an Old English poem of epic character, on the deeds of BEOWULF, a prince of the Gēatas (the Götars of southern Sweden), who killed first Grendel, a monster of the moors and fens that had infested Heorot, the banqueting-hall of the Danish king Hrothgar; then Grendel's mother in her cave under a mere; and long afterwards, as the aged king of his own people, a dragon whose hoard had been rifled. His last victory costs him his life, and the poem ends with his cremation.

The only manuscript of the epic is a codex now in the British Museum, which once belonged to Sir Robert Cotton, and was much injured by the fire in the Cottonian Library in 1731. It is the work of two scribes. The handwriting of both is of the end of the 10th century. The poem consists of over 3000 alliterative lines, and is the oldest long poem in any Germanic tongue. Its language is West Saxon in the main, not without a sprinkling of forms which are not West Saxon. There is reason to believe that it was originally written in an Anglian dialect, most probably Mercian. The poem must be referred to a very early stage of English culture. Christianity had been intro-

duced, but the poet is describing an earlier world, a heroic age remarkably Homeric in temper and manners. The Christian touches are slight, yet the old heathen customs have begun to be forgotten; the Swedish antiquary Knut Stjerna found the poet inaccurate in his archæology. Evidence for date is indefinite, but such as it is it points to the early part or perhaps the middle of the 8th century. Of the poet nothing whatever is known. The characters of *Beowulf* are Geats and Danes; its scenes Heorot (probably Leire, near Roskilde) and the land of the Geats. Franks, Frisians, Swedes, and many other Germanic peoples the poet knows of: the English appear only in the digression on King Offa and his bloodthirsty queen Thryth, whose story belongs to the time when the English were still a Continental folk. It used to be thought, therefore, that *Beowulf* must be a translation from the Danish. What fragments remain, outside of *Beowulf*, of Old English heroic poetry prove that for subjects it ranged impartially over the whole Germanic world. The evidence of proper names, moreover, is conclusive. Such of the personages as have been traced in history or saga have names which exhibit all the sound-changes of the English language between their own time and the poet's; therefore they must have been transmitted through English channels, unless we are to suppose that the English writer was a philological expert. Thus Gregory of Tours and the author of the *Gesta Francorum* tell of the disastrous raid of Chochilaicus upon the Franks and Frisians about 512 or 520 A.D. Chochilaicus and its variants are Latinised representatives of the primitive form *Hugilaikaz*, which develops quite regularly into *Hygelac* in Old English. The raid is referred to in *Beowulf*, in which Hygelac is not a Danish king as in Gregory, but Beowulf's uncle, king of the Geats. Many of the Danish princes can be identified in the sagas and in Saxo Grammaticus. Hrothulf, Hrothgar's nephew and associate in the government, is seen to be no other than the famous Hrolf Kraki.

Beowulf himself, however, nowhere appears in history or tradition, and he is doubtless a fictitious interpolation in the Geatish royal line. Some confusion arises from the fact that there are two Beowulfs in the poem. Besides the hero there is an ancestor of the kings of the Danes, Beowulf the son of Scyld Seefing, who appears in the introduction only. Now the ancient English kings, not content with tracing their descent from Woden, carried it some generations beyond. In some West Saxon genealogies there appears among the ancestors of Woden, Beaw, son of Sceldwea or Scyld, whom Ethelwerd makes son of Seef. It has been conjectured that owing to likeness of names the deeds of a corn-god Beaw have been attributed to the hero Beowulf, and Beowulf's name in exchange has been given to Beaw. Explanations of the story as a nature-myth long held the field, especially Müllenhoffs. Beaw (and so Beowulf) was regarded as a divine protector of mankind, representing cultivation and settled dwelling, his name assigned to the root *bhū*, 'to be, dwell, grow.' Grendel was a personification of North Sea's inundations in spring; his mother the depths. The dragon was the foul weather of the departing year, when the god's strength had waned. There was no lack of similar explanations. Grendel for some was a pestilence, or the grinding of the captive 'at the mill with slaves.' Even the swimming match with Breca was taken as a sun-myth. Breca represented the breakers, outstripped in their journey across the sea by Beowulf the sun-god. Nature-myths have lost their hold upon us. The mythological theories of Beowulf have been powerfully assailed by Professor Lawrence and others. Yet some

would find a residue of truth in them. Beow or Beaw seems indeed to have been a barley-spirit. For the story of Beowulf the Geat, however, parallels have been found in folk-tales. Dragon stories, of course, are plentiful enough. The adventures with Grendel and his mother belong to the class of tales called 'The Bear's Son.' Those elements in the Bear's Son cycle of stories which did not suit the poet's purpose have yet in some cases left traces to confirm the relationship. Especially close is the kinship between *Beowulf* and the stories of Grettir, of Orm, and of Bothvar Bjarki.

Since Ettmüller some have believed the work to be an amalgam of several poems. Müllenhoff maintained that the Grendel fight and the dragon fight were originally lays by different authors. To the first of these another poet added the fight with Grendel's mother, and yet another wrote the introduction. Interpolator 'A' added the story of Beowulf's home-coming, and inserted passages in the other parts; and then interpolator 'B' combined the whole of A's product with the dragon story and added most of the episodes, with moralisings and Christian theologisings. Other dividers have divided differently. A recent tendency is to grant that such a thing might have happened, but to deny that there is any evidence that it did happen. Scrutiny has failed to prove such differences in style as one should expect on the lay hypothesis. Moreover, the leisurely manner of narration is unlaylike. The poet might well have got his matter from lays, but hardly much of his text. Even the Christian elements in the poem, superficial and out of keeping as they seem to many, do not daunt the assertors of its unity.

The poem was first edited by Thorkelin (Copenhagen, 1815), afterwards by Kemble (London, 1833), Thorpe (1855), Thomas Arnold (1876), Harrison and Sharp (1883), Wyatt (1894; re-edited by R. W. Chambers, 1914), Sedgefield (1910), Klaeber (1922). German editions are those of Heyne (1863; re-edited by Schücking, 1918), Grein (1867; re-edited by Wülker, 1881), Zupitza, an autotype of the MS. (1882); Möller (Kiel, 1883); Holder (Freiburg, 1884); Trautmann (1904); Holthausen (1905-6, &c.). See translations by Kemble (1837), Thorpe, Arnold, Lumsden (1881), Garnett (1883), Earle (1892), William Morris and Wyatt (1895), Clark Hall (1895, 1914), Tinker (1902), Huysse (1907), Gummere (1909), Scott Moncrieff (1921); the researches (in German) of Ten Brink (1888), Sarrazin, Müllenhoff, Sievers, Boer, Brandl, Morsbach, Panzer, Deutschbein, Schücking, Björkman; (in English) by Chadwick, Chambers, Lawrence, and Klaeber; (in Danish) by Olrik; Sweet in Hazlitt's edition of Warton's *History of English Poetry*; Morley, *English Writers* (1887); Stopford Brooke, *English Literature to the Norman Conquest* (1898); W. P. Ker, *Epic and Romance*; A. S. Cook, *Concordance to Beowulf* (1911); Knut Stjerna's *Essays on Questions connected with Beowulf* (trans. 1913); and R. W. Chambers's full and learned study (1921).

Bequeath (A.S. *bicwethan*), a word meaning originally to declare, and in the technical language of English law, to leave personal property by will to another. In Scots law the words bequeath and bequest are less used than in England. In both countries the expression 'leave and bequeath' is appropriate to the disposal of personal property, but in neither country would the courts defeat the intention of a testator to include his heritable or real estate, if that intention sufficiently appeared. See LEGACY, WILL.

Béranger, PIERRE JEAN DE, a popular songwriter of France, was born on the 19th August 1780, in the street of Montorgueil, in Paris. His father, a notary's clerk, had left his mother six months after their marriage, and Béranger was brought up by his grandfather, Champy, a tailor, until his ninth year, when he passed into the care of an aunt who kept an inn in the suburbs of Péronne. She was an

ardent republican, and appears to have taken pains to imbue her nephew with her political principles. From his fourteenth to his seventeenth year Béranger worked as apprentice to a printer in Péronne. He afterwards acted as a clerk to his father, who about this time gained a fortune by financial enterprises, only to lose it, however, in 1798. Béranger then settled in Paris, and gave himself to literature, living in the garret of which he has sung so charmingly, planning the most ambitious works (among them an epic on Clovis), and making careful studies of French style, until in 1804 distress compelled him to ask aid from Lucien Bonaparte. The assistance sought was willingly given; and about three years later the poet Arnault found Béranger a clerkship in the office of the Imperial University, a post which he held until 1821. On the publication of the first collection of his songs in 1815, he was recognised as the lyrical champion of the opposition to the Bourbons. His popularity with the working-classes was immense. It was for them that he always wrote, and they repaid him with an ardour of gratitude and admiration such as no other poet has excited in modern times. The *chanson*, in which the 18th-century writers had trifled in praise of love and wine, became in his hands a trenchant political weapon.

His politics, a curious compound of republicanism and devotion to the Napoleonic legend, exactly hit the taste of the multitude. His songs passed from mouth to mouth before they were published; since the invention of printing he is the only poet, it has well been said, who might have dispensed with the services of the press. For a time the government did not interfere, but two volumes which he published in 1821 led to a trial, at the close of which he was fined 500 francs and sentenced to three months' imprisonment in St Pélagie. Another volume, issued in 1825, was the cause of a second prosecution. Béranger was on this occasion fined 10,000 francs and condemned to nine months' imprisonment in La Force, where he was visited by Hugo, Dumas, Sainte-Beuve, and others of the greatest men of the day. In 1830 he published *Chansons Nouvelles*, and in 1840 he wrote the story of his life. In 1848 he was elected, against his will, by more than 200,000 votes to represent the Department of the Seine in the Constituent Assembly. He took his seat, but a few days afterwards begged to be allowed to resign. He rejected sundry offers of advancement from Napoleon III., and lived in retirement during his last years. He died at Paris on July 17, 1857. Béranger has been repeatedly compared to Burns, but he has neither the passion nor the deep humour of the Scottish poet. His songs cover a wide variety of subjects. Their vivacity and wit and tripping lightness of movement, their spontaneity and humanity, their gaiety which trembles into pathos, their satire which melts into laughter, their inimitable simplicity and seemingly unstudied grace of workmanship, explain and justify the unequalled popularity which their author secured and still retains among his countrymen. See *Ma Biographie* (Paris, 1857), and his correspondence edited by Boiteau (4 vols. 1859-60); also Jules Janin's *Béranger et son Temps* (Paris, 1866); Nivalet, *Béranger et son Œuvre* (1892); and Boule, *Béranger, sa Vie, son Œuvre* (1908).

Berar', or HYDERABAD ASSIGNED DISTRICTS, was until lately a central province of India, forming a commissionership under the resident of Hyderabad (Haidarabad); but since 1902-3, having been leased in perpetuity to Britain, it is practically incorporated with the Central Provinces, between which and the Nizam's Dominions it lies. It is 150 miles long by 144 broad; area, 17,711 sq. m.; population, 3,000,000. Berar consists of the districts of Amraoti, Ellichpur, Wun, Akola, Buldana, and

Basim, assigned to the British government under the treaties of 1853 and 1861 with the Nizam of Hyderabad, who was bankrupt, and unable to pay a large and increasing debt. The province is mainly a broad valley running east and west, between the Satpura Range in the north and the Ajanta Range on the south, and is divided into the *Balaghat* or upland country, and the *Payanghat* or lowland country. The valley at the base of the Satpuras, consisting of black loam, is extremely fertile, and is one rich sheet of waving crops in harvest time. It is traversed in its length by the Purna—itself a tributary of the Tapti—which, with its numerous affluents, affords an ample supply of water to the valley, and it is thus peculiarly suitable to the cultivation of cotton, forming indeed the richest and most extensive cotton-field in India. The other products are millet, oil-seeds, wheat, pulses, tobacco, and castor-oil. Beds of coal are found near the Wardha River, in the Wun district; iron ore is plentiful in the east, and the only natural lake is the salt Lake of Louár. The Great Indian and Peninsular Railway runs through the province from east to west. Ellichpur (pop. 24,000) was the capital of the old kingdom. The British, under General Wellesley, helped the Nizam in 1803 to crush the Mahratta power.

Berat, a town of Albania, 30 miles N.E. of the seaport of Avlona. It is the seat of a Greek archbishop. Pop. about 8000, a third of whom are Greeks.

Berber, a town on the right bank of the Nile, below the confluence of the Atbara, about 200 miles N. by E. of Khartum, was long the head of the great caravan route from the Nile to Suakin. It is mostly built of mud houses, and stretches for several miles on the east bank of the river. It is a station on the railway from Khartum to Cairo, and direct communication by rail with Suakin and Port Sudan through Atbara junction was opened in 1906. Pop. about 10,000.

Ber'bera, a seaport of British Somaliland, with a good harbour, on a bay of the Gulf of Aden. It was conquered by Egypt in 1875, but in July 1884 the British government took possession of it, and a small Indian force is now stationed there. It is the scene of a large annual fair, which brings over 30,000 people together from all quarters in the East. Coffee, grains, ghi, gold-dust, ivory, gums, cattle, ostrich-feathers, &c. are brought hither from the interior, and exchanged for cotton, rice, iron, Indian piece-goods, &c.

Berberid'ææ, or BERBERIDACEÆ, a natural order of archichlamydeous dicotyledons, of which the different species of Barberry (q.v.) afford the best-known examples. Many of the plants of this order are spiny shrubs; others are herbaceous perennials. Their leaves are alternate; their flowers are usually in racemes, and are readily characterised by their trimerous symmetry and recurved anther valves; the fruit is either a berry or a capsule, and is usually acid, bitter, or astringent. There are more than 100 species, widely distributed through the temperate zone and on the mountains of the tropics, but absent from South Africa and Australasia.

Berbers, the general name usually given to the tribes inhabiting the mountainous regions of Barbary and the northern portions of the Great Desert. It is derived, according to Barth, either from the name of their supposed ancestor, *Ber*, which we recognise in the Lat. *A-fer*, an African, or from the Greek and Roman term *Barbari*. The name by which they call themselves, and which was known to the Greeks and Romans, is Amázigh, Mazigh, Mazys, &c. according to locality, and

whether singular or plural. These tribes have a common origin, and are the descendants of the aboriginal inhabitants of Northern Africa. They belong to the Hamitic family, and though they have been conquered in succession by the Phœnicians, Romans, Vandals, and Arabs, and have become, in consequence, to some extent a mixed race, they retain in great part their distinctive peculiarities. Till the 11th century, the Berbers seem to have formed the larger part of the population inhabiting the southern coast of the Mediterranean, from Egypt to the Atlantic Ocean; but, on the great Arab immigrations which then took place, they were driven to the Atlas Mountains, and to the desert regions where they now live. In Algeria, where they usually are termed Kabyles (*K'bila* = 'union'), they long remained unconquered by the French; and in Morocco, where they are called Shelluh, they are only in form subject to the sultan. The Rifs have given much trouble to the Spaniards. The Berbers occupying the desert, who are called Tuareg or Tawarek by the Arabs, have become much mixed with the negro race. The number of the Berbers is estimated at between eight and ten millions. They are of middle stature, sparely but strongly built, and the complexion varies from reddish to yellowish brown. Their manners are austere, and in disposition they are cruel, suspicious, and implacable. They are usually at war either with their neighbours or among themselves, and are possessed of a wild spirit of independence, which makes it impossible for them to unite for any common purpose. They live in clay huts and tents, but in their larger villages they have stone houses. They have herds of sheep and cattle, and practise agriculture. The mines of iron and lead in the Atlas are wrought by them, and they manufacture swords, guns, and gunpowder. They formerly professed the Christian religion, but are now adherents of Islam. A *Dictionnaire Française-berbère* was prepared by Brosselard and Jaubert (1844). See also Renan, *La Société Berbère*; Jules Lionel, *Races Berbères* (1894); René Basset, *Contes Berbères*, with bibliography (1887), and *Nouveaux Contes Berbères* (1897); Sergi, *Africa* (1897). See AFRICA, BASQUES.

Berbice, the eastern division of British Guiana (q.v.), bounded on the E. by the Corentyn and Dutch Guiana. Area about 21,000 sq. m. Once a separate colony, Berbice was united with Essequibo and Demerara under one government in 1831. The chief product is sugar, with rum, molasses, timber, cocoa, and tropical fruits. The forests abound with splendid timber-trees, including the mora and bullet-tree. The Berbice River is navigable for small vessels 175 miles from its mouth. An important affluent is the Canje. New Amsterdam, on the right bank of the Berbice River (pop. 8000), is the chief town and port of the district. See GUIANA.

Berchem, or BERGHEM, NICHOLAS, an eminent Dutch painter, was born at Haarlem in 1620, and having studied under his father and Van Goyen, Weenix the elder, and other masters, he spent several years in Italy, where he soon acquired an extraordinary facility of execution. His industry was naturally great; and his innumerable landscapes now decorate the best collections of Europe. The leading features of Berchem's works, besides the general happiness of the compositions, are warmth of colouring, a skilful handling of lights, and a mastery of perspective. His etchings are also highly esteemed. He died in 1683.

Berchemia. See SUPPLE JACK.

Berch'ta (modern form *Bertha*, the Old High German *Perahta*, 'the bright'), a goddess of South German mythology, apparently the same as the

Hulda ('the gracious') of Northern Germany. In Dame Hulda, the gracious and kindly aspect came to be the predominant; but in Dame Berchta, the severe and awe-inspiring, the reason for this being that the popular Christian view had degraded her lower than Hulda. Dame Berchta has the oversight of spinners; whatever spinning she finds unfinished on the last day of the year she spoils. Her festival is kept with a prescribed kind of meagre fare—oatmeal-gruel, or pottage, and fish. If she catches any one eating other food on that day she cuts his stomach open, fills it with chopped straw, and sews up the gash with a ploughshare for a needle, and an iron chain for a thread. She is represented in some places as having a long iron nose and one big foot. It is likely that many of the attributes of Berchta were transferred to the famous Berthas of medieval history and fable, as Berta, wife of King Pippin and mother of Charlemagne. She has been connected with the feast of the Epiphany (6th January), and has been explained by some as a personification of the brightness of the heavenly vision that appeared to the shepherds in the field; but it is far more likely that the analogy of the 'bright' day was tacked on to a previously existing Perhta, a deity of heathendom. The numerous stories of the 'White Lady' (q.v.) who appears in noble houses at night, and acts as the guardian angel of the race, have doubtless their root in the ancient heathen goddess Berchta.

Berchtesgaden, a village of Bavaria, charmingly situated on a mountain-slope, about 15 miles S. of Salzburg. Its abbey was afterwards a royal castle, and in the neighbourhood is a former royal hunting-lodge. The place is most remarkable for its government salt-mines. Fresh water led into the mine is run off as brine into a reservoir, and conveyed to Traunstein and Rosenheim, 40 miles distant. The district was an ecclesiastical principality, secularised in 1803.

Berchtold, COUNT LEOPOLD, born 1863, was Austro-Hungarian foreign minister in 1912-15, presented the ultimatum to Serbia in 1914, and is held by many to be one of those chiefly responsible for the outbreak of war.

Berck-sur-mer, a French harbour and bathing resort in Pas-de-Calais, 22 miles S. of Boulogne, with some shipbuilding and sailmaking; pop. 10,000.

Berdiansk', a seaport of Ukraine (Taurida), has the finest harbour in the Sea of Azov, and is a place of commercial activity; pop. 33,000.

Berditchev', a town of Ukraine, 108 miles WSW. of Kiev by rail, famous for its five annual fairs; pop. 74,500, largely Jews.

Bere, a kind of Barley (q.v.).

Bere'ans, an almost extinct sect of Christians, who originated in Scotland in the 18th century. They took this name from the people of Berea, who are spoken of in Acts, xvii. 11, as having 'received the word with all readiness of mind.' Their founder was the Rev. John Barclay (1734-98), a native of Muthill, in Perthshire, who acted as assistant minister at Fettercairn for nine years. They believe that the knowledge of God's existence and character is derived from the Bible alone, and not from reason or nature; that the Psalms of David relate exclusively to Christ; that assurance is of the essence of faith; and that unbelief is the unpardonable sin. In other points of doctrine they are ordinary Calvinists.

Beregonium is a misprint in the Ulm edition of Ptolemy's Geography (1486) for *Rerigonium*, a town of the Novantæ, now identified with the fort of Innermessan on the east shore of Loch Ryan. Boece applied the name Beregonium to a large

vitrified fort in Ardechattan parish, Argyllshire, 5½ miles NNE. of Oban. But there is no historical ground for supposing this to have been a seat of ancient kings, Scottish or other, as is often assumed.

Be'rengar I., king of Italy, succeeded at his father's death to the dukedom of Friuli. After the deposition of Charles the Fat in 887, he was crowned king of Italy, but he soon irritated the nobles by condescending to hold his territory in fief from Arnulf, king of Germany; and Guido, Duke of Spoleto, was persuaded to contest the throne. With the help of Arnulf, however, Berengar ultimately prevailed. After Guido's death in 894, his son, Lambert, compelled the king to share with him the sovereignty of North Italy until 898, when Lambert was assassinated. Berengar's influence quickly sank, since he could not check the plundering incursions of the Magyars and Arabs, and many years were spent in struggles to maintain his position. In 915 he was crowned emperor by Pope John X.; but the nobles again revolted, and under Rudolf of Burgundy completely overthrew him in 923. In his extremity, Berengar called in the Hungarians to his aid, which unpatriotic act alienated the minds of all Italians from him, and cost him his life, for he was assassinated in 924.—**BERENGAR II.**, grandson of the preceding, succeeded his father as Count of Ivrea in 925, and married Willa, niece of Hugo, king of Italy, in 934. For a conspiracy against Hugo, he was compelled to flee to Germany, where he was kindly received by the emperor, Otto I. In 945 he recrossed the Alps at the head of an army, and placed the weak Lothaire, the son of Hugo, on the throne. On the death of this prince, who was probably poisoned by Willa, Berengar allowed himself to be crowned along with his son, Adalbert, in 950. His tyranny induced his subjects to call in the aid of the emperor, who marched into Italy in 961, and took possession of the country. After three years' refuge in a mountain-fortress, Berengar surrendered, and was sent as a prisoner to Bamberg, in Bavaria, where he died in 966.

Berengaria. See RICHARD I.

Berenga'rius OF TOURS, a distinguished scholastic theologian, was born at Tours, in France, 998 A.D. In 1031 he was appointed preceptor of the school of St Martin in Tours, and, about 1040, archdeacon of Angers. Here he first drew upon himself the charge of heresy in reference to the doctrine of transubstantiation. He held that the bread and wine in the sacrament of the eucharist remained bread and wine, and that the faith of the believer who recognised their symbolic meaning only transformed them subjectively into the body and blood of Christ. This interpretation was condemned by Pope Leo IX. (1049-50). In 1054 Berengarius retracted his opinion before the Council of Tours, but immediately returned to his conviction, and commenced to advocate it anew. For this he was finally, in 1078, cited to appear at Rome, where he repeatedly abjured his 'error,' but never seems to have really abandoned it. Hildebrand, now Pope Gregory VII., treated him with great moderation; and at last conceived it best to let him alone. Harassed and weakened by the attacks of the orthodox party, headed by Lanfranc of Canterbury, he finally retired to a cell at St Côme, on an island in the Loire (now a ruin on the south bank), near Tours, where he spent the last years of his life in devotional exercises. He died in 1088. The greater number of his works are lost; such as are extant have been collected and published by A. F. & F. T. Vischer (Berlin, 1834).

Berenice (modern name, *Sakayt-el-Kubli*), a town of Egypt, on a bay in the Red Sea, 20 miles

SW. of Ras Benass. It was founded by Ptolemy Philadelphus, and was in ancient times the emporium of the trade with India, but it is now ruined, and interesting only for its antiquities.

Berenice, the name of several celebrated women of the house of Ptolemy, including (1) the wife of Ptolemy I., celebrated by Theocritus; the daughter of Ptolemy II.; and the wife of Ptolemy III. This last queen, during the king's wars in Asia, made a vow to offer her beautiful hair to the gods when her husband returned safely—a vow which she fulfilled. The hair was suspended in the temple of Aphrodite, from which, according to the fable, it was taken to form a constellation, *Coma Berenices*.—(2) **BERENICE**, also called Cleopatra, daughter of Ptolemy IX. (Lathyrus), was, on her succession to the throne, married to Alexander II., by whom she was murdered nineteen days after marriage.—(3) **BERENICE**, daughter of Ptolemy XI. (Aulètes), eldest sister of the renowned Cleopatra, was raised to the throne after her father's deposition, 58 B.C., but was put to death when her father was restored, 55 B.C. She was first married to Seleucus, whom she caused to be put to death, and afterwards to Archelaus, who was put to death with her.—There were, besides, two Jewish Berenices—the one, daughter of Salome, sister of Herod the Great, and mother of Agrippa I.; the other, and more famous, was daughter of this latter monarch. She was three times married: her uncle, Herod, Prince of Chalcis, left her for the second time a widow, at the age of twenty; and she deserted her third husband to return to her brother, King Agrippa II., the same before whom Paul defended himself at Caesarea. After the capture of Jerusalem, she went to Rome, and Titus, who was much in love with her, would have married her but for the opposition of the people. The intimacy of Berenice and Titus forms the subject of a tragedy by Racine.

Beresford, **WILLIAM CARR BERESFORD**, VISCOUNT, general, was born in 1768, a natural son of the first Marquis of Waterford. He entered the army in 1785, in 1786 lost his left eye through an accident, and, after serving in all the four continents, bore a conspicuous part (1806) in the reconquest of the Cape, and the capture of Buenos Aires. The latter achievement was followed by his own surrender, but in 1807 he made his escape. In 1808 he did gallant service during the retreat to Corunna; and in 1809 he took the command of the Portuguese army, with the local rank of lieutenant-general. He succeeded in improving its discipline so greatly, as soon to render it highly efficient for active service. For his services at Busaco (1810) he was made a Knight of the Bath; and for his victory over Soult at Albuera (1811) he received the thanks of parliament. He was present at Badajoz, and at Salamanca, where he was severely wounded, and distinguished himself in many other battles. In 1814 he was created Baron, and in 1823 Viscount. In 1828–30 he was master-general of the ordnance. He died 8th January 1854.—Admiral Lord **CHARLES WILLIAM BERESFORD**, first Baron Beresford (1916), K.C.B., G.C.V.O. (1846–1919), a son of the fourth Marquis of Waterford, distinguished himself at Alexandria and elsewhere in Egypt and the Sudan in 1882–86, was a lord of the Admiralty (1886–88), but resigned, sat in parliament as a Conservative, and commanded the Channel Fleet and in the Mediterranean. He was a vigorous critic in naval affairs. See his *Memoirs* (2 vols. 1914).

Beresina, or **BEREZINA**, a river of White Russia, flows southward for 350 miles (over 200 of which are navigable) to the Dnieper, and is connected with the Düna by a canal, communica-

tion between the Black and Baltic Seas being thus established. The Beresina is memorable on account of the disastrous passage of the French army, November 1812, during the retreat from Moscow. Two bridges over the river were hastily constructed amid terrible hardships, and, on the 27th, the passage of the French commenced, and went on throughout the whole day. Marshal Victor's rear-guard of 7000 men, under Parton-neaux, were, however, intercepted by the Russians, and had to capitulate. On the 28th a vigorous attack was made by the Russians upon the French on both sides of the river; and they established a battery of twelve pieces to command the bridge. The panic and confusion of the French became dreadful. One bridge broke, and all rushing to the other, it was soon choked; multitudes were forced into the stream, while the Russian cannon played on the struggling mass. On the 29th a considerable number of sick and wounded soldiers, women, children, and sutlers still remained behind, until preparations were completed for burning the bridges. Then a fearful rush took place. Some 10,000 dead bodies were found on the shores of the river when the ice thawed; and the Russians took 16,000 prisoners and 25 pieces of cannon. Yet the passage of the Beresina, great as were the losses, was the one French achievement of the war. See *Napoleon* ('Cambridge Modern History,' vol. ix. 1906).

Bereslav, or **BERISLAV**, a thriving town in Ukraine, on the Dnieper, trading in wood and corn; pop. 12,000.

Beret, the cap of the Basques (q.v.).

Berezna, a town of Ukraine, 30 miles E. of the town of Tchernigoff, on a tributary of the Desna; pop. 10,000 (many Jews).

Berezov' ('the town of birch-trees'), a small town of Siberia in the government of Tobolsk, on the left bank of the Sosva, a branch of the Obi. It marks the northern limit of the region of rye, barley, and horses, and is important as a fur and skin trading station.

Berezovsk, a village in the Russian province of Perm, near Ekaterinburg, gives name to a famous gold-field, wrought since 1744. The mines are on the eastern slopes of the middle Ural chain, and the field is above 5 miles long. The washings on the Berezovka River are also very productive.

Berg, a former duchy of Germany, on the right bank of the Rhine, now incorporated with the Prussian dominions, between Düsseldorf and Cologne. It is a densely populated manufacturing country. After various vicissitudes, the duchy had merged in the electorate of Bavaria, and in 1806 Bavaria ceded it to France. Napoleon erected it into a grand-duchy, constituting his brother-in-law, Murat, its sovereign; and two years afterwards, Napoleon's nephew, then Crown Prince of Holland, was made grand-duke. The peace of 1815 gave Berg to Prussia.

Berg, **CHRISTIAN PAULSEN**, Danish politician, born in 1829, near Lemvig, in Jutland, in 1865 entered the Folksting, of which he was chosen president in 1883. In 1877 he became leader of the Radical opposition, and in 1881 editor of the *Morgenblad*; in 1886 his fierce attacks on one of the ministry brought on him six months' imprisonment. He died 27th November 1891.

Berga, a town of Catalonia, Spain, 52 miles NNW. of Barcelona. Pop. 5000.

Bergama (ancient *Pergāmos* or *Pergamon*), a city of Asia Minor, situated in a beautiful and fertile valley, 40 miles N. of Smyrna. In early times the city was the capital of the king-

dom of Pergamum (q.v.). The present population is about 6000.

Bergamo (the ancient *Bergomum*), a fortified town of Lombardy, situated on low hills, 34 miles NE. of Milan by rail. It has a castle occupying the most elevated part of the town, a cathedral, school of art, museum, lyceum, library, two theatres, &c. Silk, cotton, linen, woollen fabrics, and iron goods are manufactured. It has also an extensive trade in grindstones, quarried in the vicinity. Annually, in the month of August, the largest fair in Northern Italy is held here. Bergamo was destroyed by Attila, 452 A.D.; after the fall of the Roman empire, it became capital of a Lombard duchy, and its inhabitants placed themselves under the protection of the Venetian Republic in 1427. It is now capital of an Italian province. Tiraboschi and Donizetti were natives of Bergamo, and Bernardo Tasso, the father of Torquato, was of Bergamasco descent. The population of the commune is 55,550.

Bergamot is the name applied to a group of varieties of pear, which agree in more or less completely resembling an apple in shape, in melting juicy pulp, and pleasant flavour. See PEAR.

Bergamot is also the name of a species or variety of the genus *Citrus* (q.v.), also called the BERGAMOT ORANGE, or MELLAROSA; by some botanists regarded as a variety of the orange (*C. Aurantium*); by others, as a variety of the lime (*C. limetta*); and elevated by Risso to the rank of a distinct species, under the name of *C. bergamea*. The name comes from Bergama (q.v.), a city in Asia Minor, the ancient Pergamos. It is now cultivated in the south of Europe; and from the rind of its fruit, the well-known Oil of Bergamot is obtained, which is extensively used in making pomades, fragrant essences, eau de Cologne, liqueurs, &c. The fruit is pear-shaped, smooth, of a pale-golden colour, and has a green, subacid, firm, and fragrant pulp. The essential oil is obtained by distillation, or by grating down the rinds, and then subjecting them to pressure, which is the better method. The oil is also obtained from other varieties or species of the same genus. It is of a pale-yellow colour or almost colourless. One hundred Bergamot oranges are said to yield about 2½ ounces of oil. Oil of Bergamot is frequently employed for diluting or adulterating the very expensive blue volatile oil of Chamomile (q.v.).—BERGAMOT is also applied to certain fragrant Labiates, notably *Mentha citrata* or *odorata*, as also to species of *Monarda* (*M. fistulosa*, &c.).

Bergedorf, a district and town of Germany, 10 miles SE. of Hamburg, to which it belongs. Part of the territory is known by the name of the Four Lands (*Vierländer*). It is inhabited by a well-conditioned and industrious population, much occupied in the cultivation of fruit and vegetables, not only for the market of Hamburg, but for that of London. The area is 35 sq. m., and the population about 30,000. Pop. of town, 17,000.

Bergen, a fortified seaport in the west of Norway, and the second city of the kingdom, in the province of the same name, situated on a promontory at the head of a deep bay, and, with the exception of the north-east side, where lofty mountains inclose it, surrounded by water. The harbour is safe and commodious, and around it the town is built, presenting a picturesque appearance from the sea, with its wooden houses of various colours. It has a cathedral, various churches, schools, hospitals, and public institutions; and is the seat of a bishop, and the station of a naval squadron. The museum has valuable collections of Norse antiquities and specimens of

Norwegian fishes. The chief manufactures of Bergen are gloves, tobacco, porcelain, leather, soap, and cordage. It has numerous distilleries, and several shipbuilding yards. Its principal trade, however, is the export of stockfish, herrings, and fish-oil and roe. Twice a year, the Norlandmen come to Bergen with their fish, receiving in exchange for them such articles of necessity or luxury as they require. The annual value of the stockfish exported from this port is about £450,000. In addition, it exports about half a million barrels of herrings and 20,000 barrels of cod-liver oil. There is constant steam communication with Copenhagen, the Baltic ports, Hamburg, Rotterdam, Hull, Newcastle, and New York. Since 1883 Bergen has been connected by railway with the north of the Hardangerfjord. The chief imports are brandy, wine, corn, cotton, woollens, hemp, sugar, tobacco, coffee, &c. The climate is exceedingly humid, but not unhealthy; the yearly rainfall is 89 inches, and the temperature averages 46° F. Bergen, formerly called Björgvin ('the pasture betwixt the mountains'), was founded about 1070 by Olaf Kyrre, who made it the second city in his kingdom, and it was soon raised to the first rank. English and Scottish traders were early displaced here by the merchants of the Hanse towns, who continued to exercise and abuse their monopoly until their supremacy was broken by an act issued by Frederick II. of Denmark in 1560; and in 1763 their last warehouse fell into the hands of a citizen of Bergen. In the 13th century, Bergen had thirty churches and religious houses, but these have been mostly swept away in the numerous conflagrations which have devastated it from 1189 to 1916. The town was long the most important trading town of Norway, but has been outstripped by Christiania. The castle of Bergenhus was till 1397 the residence of the Norwegian kings. Bergen was the birthplace of Holberg, the painter Dahl, Welhaven, Ole Bull, and Grieg. Pop. 90,000.

Bergen-op-Zoom, a town formerly strongly fortified, in the Dutch province of North Brabant, 21 miles N. by W. of Antwerp, and 39 E. by N. of Flushing. It stands on the little river Zoom, at its entrance into the east branch of the Scheldt, in a marshy district, frequently inundated. It has a harbour, manufactures of brick and earthenwares, and a large trade in anchovies. Population, 15,000. The importance of its position rendered the town the object of many contests. The Netherlands made it one of their strongholds in their struggles with Spain, and the Spaniards, who had been expelled in 1577, unsuccessfully attempted to capture the place, either by siege or storm, in 1581, 1588, 1605, and 1622. The fortifications were afterwards strengthened by the engineer Coehorn, so as to give it the reputation of being impregnable. Yet the French, under Count Löwendal, in 1747, after a siege of nearly three months, and the springing of 41 mines by the assailants, and 38 by the defenders, took the place by storm, and in 1795 it capitulated without resistance to Pichegru. Being incorporated with France in 1810, it was blockaded in 1814 by the English, who attempted to surprise the fortress on the night of the 8th of March with a force of 3900; but after carrying the greater part of the works, they were, through Sir Thomas Graham's remissness in sending support, overpowered by the brave garrison, and either slain or forced to surrender. The French only gave up the post under the Treaty of Paris; in 1867 the fortress was demolished.

Bergenroth, GUSTAV ADOLF, historian, born in Prussia, 1813, studied law, and entered the state service, from which he was dismissed, owing to his

revolutionary views, in 1848. Becoming further compromised, he went to America in 1850, but settled in 1857 in England, where he devoted himself to the study of the state papers of the Tudor reigns. After a visit to Simancas, in Spain, he published his great *Calendar of Letters, Despatches, and State Papers relating to the Negotiations between England and Spain* (3 vols. Lond. 1862-68). He died in Madrid, 13th February 1869.

Bergerac, a town in the French department of Dordogne, on the Dordogne, 60 miles E. of Bordeaux, with ironworks and distilleries, and a trade in wine, chestnuts, and truffles; pop. 11,000.

Bergerac, SAVINIEN CYRANO DE, a French author, born in Paris 1619, distinguished for his courage in the field, and for the number of his duels, more than a thousand, most of them fought on account of his monstrously large nose. He died in 1655. His writings, which are often crude, but full of invention, vigour, and wit, include a tragedy, *Agrippine*, and a comedy, *Le Pédant Joué*, from which Corneille and Molière borrowed ideas; and his 'comic histories of the empires of the sun and moon' probably suggested 'Micromégas' to Voltaire, and 'Gulliver' to Swift. He was a pronounced free-thinker. His name and his nose have been rendered familiar by Rostand's comedy (1898). See two books by P. A. Brun (1893, 1909).

Berghaus, HEINRICH, an eminent geographer, was born at Clevés, in Rhenish Prussia, in 1797. His early services as an engineer in the French and Prussian armies largely advanced his knowledge of geodesy. After being employed on the trigonometrical survey of Prussia, he became (1824) professor of Mathematics in the Architectural Academy of Berlin, and (1836) director of the Geographical School in Potsdam. The best known of his cartographical works is his *Physical Atlas*. He edited several geographical periodicals, and wrote numerous valuable works on physical and political geography, including the *Länder- u. Völkerkunde* (1840). His correspondence with A. von Humboldt, published at Leipzig in 1863, fills 3 vols. He died at Stettin, 17th February 1884.

Berghem. See **BERCHEM**.

Bergk, THEODOR, a distinguished German classical scholar, born at Leipzig, 22nd May 1812. From 1842 to 1869 he was professor of Philology successively at Marburg, Freiburg, and Halle. In the latter year ill-health enforced his retirement, and the remainder of his life was spent in preparing his *Geschichte der griechischen Literatur*, of which, however, he finished the first volume only (Berl. 1872), the other three being edited by G. Hinrichs (1883-88). Bergk's chief complete work is his *Poetae Lyrici Graeci* (3 vols. Leip. 1843). He also published numerous papers on philology and editions of individual Greek poets. He died 20th July 1881.

Bergman, TORBERN OLOF, a celebrated Swedish chemist, born at Katharinaberg, in West Gothland, 20th March 1735. A student under Linnæus at Uppsala, he was raised in 1758 to the chair of Physics there, and in 1767 to that of Chemistry. He died 8th July 1784. Bergman's earliest studies were in natural history; his later, in chemistry and mineralogy. His theory of elective or chemical affinities had an important place in the history of chemistry, and his work in mineralogy did much to prepare the way for a scientific classification of minerals. His dissertations are collected into 6 octavo vols. (Leip. 1779-81); and English translations of them fill 3 vols. (1784-85).

Bergmehl, or MOUNTAIN-FLLOUR, is a recent deposit of a white or cream-coloured powder of extreme fineness, composed almost entirely of the indestructible siliceous frustules or cell-walls of

Diatoms (q.v.). From its resemblance to flour, it has been mixed with ordinary food in seasons of scarcity, and thus used by the inhabitants of Norway and Sweden, who suppose it to be nutritious. When subjected to a red heat, it loses from a quarter to a third of its weight, the loss consisting probably of organic matter, and this would make it in itself nutritious; but it seems to derive its chief value from its increasing the bulk of the food, and rendering the really nutritious portion more satisfying. On the other hand, some experiments tend to show that bergmehl does contain a very small proportion—3 or 4 per cent.—of positive nutriment. Similar deposits occur at Dolgelly in North Wales, at South Mourne in Ireland, and in Mull, Raasay, Skye, and elsewhere in Scotland. The contained organisms show that these beds have been deposited in fresh water.

Bergschrund, a crevasse formed where a glacier or snow-slope starts away from the mountain-side.

Bergson, HENRI LOUIS, born in 1859, professor of Philosophy at the Collège de France, Paris, is one of the outstanding thinkers of the present time. His chief works—which are no less remarkable for the brilliance of their style than for the striking character of the views they set forth—are (1) *Essai sur les Données immédiates de la Conscience*, 1889 (Eng. trans. under the title of *Time and Free-will*, 1910); (2) *Matière et Mémoire*, 1896 (Eng. trans. 1911); (3) *Le Rire*, 1900 (Eng. trans. 1911); (4) an article in the *Revue de Métaphysique et de Morale* called 'Introduction à la Métaphysique', 1903 (Eng. trans. 1913); (5) *L'Évolution créatrice*, 1907 (Eng. trans. 1911); (6) *L'Énergie spirituelle*, 1919 (Eng. trans. 1920). In the present article it must suffice to indicate some of the main ideas presented in 1, 4, and 5.

The original aim of the *Essai* was to deal with the problem of free-will, but the book as a whole really covers a much wider ground. It asserts in the strongest form that doctrine of the polar opposition between consciousness and the world of things in space, which is one of the most fundamental doctrines of Bergson's philosophy. The external world, as science knows it, is a world of discrete measurable things, whose ultimate or atomic elements may undergo rearrangement, but never really change, and whose relations are rigidly determined by mechanical laws. Consciousness is for Bergson the polar opposite of all this. It is complex yet indivisible; for all its partial phases and successive stages interpenetrate each other. It is wholly qualitative: when we attribute quantitative determinations to it, we do so by a confusion—e.g. when we call one sensation more intense than another we are describing an experienced difference between the sensations in language which is really appropriate, not to the sensations themselves, but to the stimuli which cause them. Above all, consciousness is characterised by 'duration'—i.e. by a continuous change or flux of content. To get at the full meaning of this cardinal term in Bergson's philosophy it is best to begin by way of contrast. Scientific psychology has long recognised that consciousness is incessantly changing, but then it represents this changing consciousness as consisting of a series of successive states or ideas, and thereby fatally obscures the very fact which it is trying to express. For it is the very essence of the flux of consciousness to be continuous, to be incapable of being split up into discrete states or elements, to be always growing and expanding, to carry on the past into the present without a break. And just because consciousness is thus always moving forward, while it yet retains in a sort of cumulative memory an ever-lengthening

past, it never repeats itself. There is always in consciousness an aspect of novelty or unpredictability. It is here that Bergson's view of free-will attaches itself to his view of consciousness. Looking back on the past we seem to be able to trace a necessity of sequence even in consciousness, but this is only because the sequence is already complete. From the creative present, on the other hand, the aspect of novelty can never be eliminated. True, we form habits, and the more we surrender ourselves to their guidance, the more possible a sort of approximate prediction becomes. But prediction is never possible in all its fullness, and it is less and less possible in proportion as we resist the deadening influence of habit and concentrate our whole soul on the decision before us. It is in such moments of full concentration—which Bergson regards as rare—that we rise to true freedom of will.

In describing the flux of consciousness Bergson makes a free use of metaphors and images—e.g. the phases of consciousness are said to melt into each other like the colours of the spectrum. He does this deliberately, because in his view the intellect, triumphant in the sphere of mechanical and mathematical science, is incapable of grasping the real nature of 'duration.' Its method is that of conceptual analysis: it is always trying to break up its object into simple elements and to characterise it by means of fixed and sharply defined concepts. Now this is a method which answers admirably when we are dealing with a world of things occupying distinct positions in space and consisting of a matter that is at bottom inert and changeless. The intellect, in fact, is essentially adapted for this very purpose of dealing with the external world: it is an instrument of action. But its method becomes less and less applicable as we pass to facts of life and consciousness, and have to deal with continuous movement. When a person lifts his arm (to take one of Bergson's favourite illustrations) he is conscious of the movement in its unity and singleness, whereas for an external observer the movement appears as a series of positions. Now the intellect can never by adding together successive positions recover the inner unity of the movement as experienced. To grasp this inner unity we must have a kind of apprehension distinct from intellect, an immediate intuition, in which consciousness, turning sharply away from the external world, becomes aware of its own true nature. Only when we have thus grasped directly, in our own conscious experience, the meaning of 'duration' are we prepared to interpret sympathetically other forms of life.

Convinced that in 'duration' he has found 'the very stuff of reality,' Bergson seeks in his *Creative Evolution* to apply this insight beyond human consciousness to the whole evolution of life on earth, and even to the ultimate nature of reality. Life and consciousness show themselves in other forms than the human. Over against the human intellect, e.g., must be set animal instinct, which reaches perhaps its highest development in comparatively low forms of life. Thus behind these specialised forms of consciousness, behind even the contrast of vegetable and animal life, we are led to assume some original 'vital impulse,' which is seeking in diverse ways to realise itself against the obstacles which its material environment opposes to it. Bergson proceeds, accordingly, to sketch out on these lines a view of evolution for which he claims a higher truth than is possessed by current views, whether of a more mechanical or a more teleological cast. Finally, a still bolder flight of metaphysical intuition remains to be made. Matter itself must be brought into relation with the 'duration' or inner life—the creative activity

—of the universe as a whole. Viewed in this way it is seen to be, not a new or additional sort of reality, but simply a result of the interruption or relaxation of the creative activity itself. On this more metaphysical side of his philosophy, however, Bergson's views are not yet fully worked out.

There are brief expositions of a popular kind by H. Wildon Carr (in 'People's Books' series) and J. Solomon (in Constable's series); more technical discussions by A. D. Lindsay, *Philosophy of Bergson*, and J. M'Kellar Stewart, *A Critical Exposition of Bergson's Philosophy*. William James's enthusiastic appreciation of Bergson's 'Critique of Intellectualism' in *A Pluralistic Universe* indicates the point of contact between Bergson and Pragmatism. There is a bibliography of writings by and on Bergson in the Eng. trans. of the *Essai*.

Bergues, a town in the French department of Nord, on the Colme, 5 miles SSE. of Dunkirk, fruitlessly besieged by the English in 1793; pop. 5500.

Bergylt (*Sebastes norvegicus*), a common fish in northern seas, belonging to the family Scorpenidae, in the great order of fishes with spinous rays (*Acanthopterygii*). It is somewhat like a perch in appearance, and used to be called *Perca marina*; no resemblance, however, can justify another of its names—the Norway Haddock. It attains a length of 2 feet or more, has a red colour, and is good for food. Though occasionally found on British coasts as far south as Berwick, its true home is farther north. The genus *Sebastes* includes 24 other widely distributed species.

Berhampur, the name of two towns in British India. (1) Berhampur, in Madras, is a military station in the district of Ganjam, 18 miles SW. of the town of Ganjam, and 9 from the coast. The climate is very healthy, and there is some trade in sugar and silk cloth. Pop. 31,500. (2) Berhampur, in Bengal, on the left bank of the Bhagirathi, 5 miles below Murshidabad. It was long one of the principal military stations in British India, and the barracks, now largely devoted to other uses, still form its most prominent feature. In 1857 Berhampur was the scene of the first open act of mutiny. Pop. 26,000.

Beriberi (from the Singhalese *beri*, 'weakness'), a form of neuritis common in India, Japan, and parts of Africa, which combines anæmia, pain, and difficulty in breathing, with dropsical and paralytic symptoms. It may be acute or chronic, and is not contagious, but infests districts. It was observed that persons fed on milled or 'polished' rice suffered from it; but if the 'polishings' or pericarp were again added to the decorticated grain, the rice could be eaten with impunity. British soldiers fed on white bread and tinned meat suffered, while Indian troops fed on coarsely ground wheat and pulse did not; nor did the British when their own flour ran short and Indian wheat was given them. It is now recognised that a vitamin or 'accessory food substance' necessary for growth and health (though only a minute quantity is required) is contained in the wheat embryo, removed by European methods of milling. This vitamin occurs also in milk, eggs, pulse, and yeast. It is destroyed by the high temperatures used in sterilising tinned foods.

Bering. See BEHRING.

Berislav. See BERESLAV.

Berja, a town of Spain, 22 miles W. of Almería, with lead-mines; pop. 15,000.

Berkeley, a small town of Gloucestershire, on the Avon, 15 miles SW. of Gloucester by rail. The town lies in the Vale of Berkeley, which consists of rich meadow pasture-land, on a deep, fat loam, and is celebrated for its dairies and 'Double Gloucester' cheese. Berkeley Castle,

on an eminence to the south-east, about 1162 was granted by Henry II. to Robert Fitzhardinge, with whose descendants it has since continued for more than seven centuries, they having held the title of Baron Berkeley from 1295, and of earl and viscount from 1679. Here Edward II. was murdered in 1327. In the civil wars of Charles I., the castle held out for the king, but was taken after a nine days' siege by the Parliamentarians. Dr Jenner was a native of Berkeley, and was buried in the parish church. See John Smyth's *Lives of the Berkeleys, from 1066 to 1613*, ed. by Sir John Maclean (2 vols. 1883-84).

Berkeley, a city of Alameda county, California, overlooking the Bay of San Francisco, is the seat of the state university; pop. 56,000.

Berkeley, GEORGE, Bishop of Cloyne, an historical figure in the 18th century, whose romantic life of unselfish enthusiasm and self-sacrificing philanthropy animated a metaphysical genius still powerful in philosophical speculation. He was born in the neighbourhood of Kilkenny, on the 12th of March 1685 (N.S.), according to reliable tradition, in the half-ruined castle of Dysert, on the bank of the Nore. He was a scion of the noble House of Berkeley; his mother was a Wolfe, of the same Irish family as the hero who afterwards fell at Quebec. At the age of eleven he was sent to the Duke of Ormond's School at Kilkenny, from which he proceeded, in his fifteenth year, to Trinity College, Dublin. There he continued to reside, as student and fellow, for thirteen years. Trinity College was then influenced by independent thinkers. The philosophy of John Locke, which gave form to, and expressed the spirit of the 18th century, was already in vogue there, and, along with Descartes and Malebranche and the new physics of Newton, was superseding medieval scholasticism. To these stimulating influences the young student from Kilkenny responded with characteristically ardent enthusiasm. A *Commonplace Book* of 1705-6, lately discovered, and first published in the collected edition of his works in 1871, reveals an intellectual fermentation of extraordinary interest. Throughout its pages we see a subtle and original mind, stimulated by Locke's psychology to a conception of the universe which Locke himself never consciously approached.

The ardent spirit of the *Commonplace Book* soon found vent in philosophical authorship. Its 'new principle' was soon given to the world, first in its application only to our visual perception of things, and then, in two succeeding treatises, with philosophical comprehensiveness, as a system of universal immaterialism in which the whole world of sense is spiritualised. Accordingly, in 1709, he produced an *Essay towards a New Theory of Vision*, the purpose of which was to show that the act of seeing, which seems so immediate and indecomposable, is not really a direct and inexplicable revelation of something outside all self-conscious intelligence, but is an act of interpretation, involving a process essentially (if unconsciously) rational, which presupposes too a rational or orderly constitution in the visually interpreted phenomena themselves. The *Essay* is thus a psychological analysis of visual perception, with an ontological outcome. It was Berkeley's first step towards a clarification of the confused popular, and self-contradictory philosophical conceptions of *matter*, by its translation of the semi-conscious processes of sight into a virtual recognition of the perpetual creative agency of Supreme Reason. The argument was enlarged in scope in a *Treatise on the Principles of Human Knowledge*, in 1710, followed in 1713 by *Dialogues between Hylas and Philonous*, in which the new conception of matter

is popularised. These three books set in motion in Europe a train of speculation which, slow at first, through popular and philosophical misunderstanding, has not ceased since to move human thought about all the ultimate questions of our life and our surroundings. The central conception of the three continued to develop in Berkeley's mind throughout his life. His 'new principle'—that the world which we see and touch is not an abstract independent substance, of which conscious mind may be an effect, but is the very world that is presented to our senses, and which depends for its actuality on being perceived—was long misconstrued as the monstrous paradox that matter has no perceived existence. We are only now learning to realise, through its help, that phenomena in a sense presuppose the presence and continual agency of Supreme Reason; that external nature is thus throughout and always supernatural; that the orderly evolution of its sense phenomena, in inorganic and organic things, interpreted in natural science, is, for mere science, only a succession of phenomena, but that to the eye of philosophy these phenomena are severally and collectively dependent on the immanence of Reason, and ultimately on the moral agency of Spirit—so that the evolution of finite things, even in an endless succession, is in no way inconsistent with their being the subjects of constant creative activity. The material world of Berkeley is just what the senses present: all in it beyond this belongs to the world of mind, which converts the presented phenomena into a language that is expressive of absent sense phenomena, of other finite spirits, and of the all-pervading Reason that is supreme and absolute. What we know beyond sense phenomena is their intelligible synthesis in the form of variously qualified things. Our objective perception of this external or interpretable world is reached, not through any single sense, but through sense symbolism, which enables us to connect what is actually present in one sense with what is conditionally presentable in the others. Belief in the real existence of the external world is belief in the permanence of this intelligible connection among sense phenomena. This belief presupposes that we are in a trustworthy and intelligible universe, in which the sense signals presented to us to regulate our lives by may be depended on. Our security for the reality of the Berkeleyan external world is the thus inevitable assumption that nature is reasonable; that its phenomena express thought akin to our own; that it is more or less interpretable by us in progressive physical or natural science; and that even in the world of the senses we are living and moving and having our being in the supreme all-pervading Reason, theologically called God.

In 1713 Berkeley went to London, and was introduced by his countryman Swift to the statesmen and men of letters who there formed a brilliant society in the reign of Queen Anne. After spending nearly a year in London, he gave seven years to travel in France and Italy, first as chaplain to the brilliant and eccentric Earl of Peterborough, and afterwards as tutor to a son of the Bishop of Clogher. His journals, lately recovered, contain vivid descriptions of this continental experience, including adventures in crossing Mont Cenis in winter, a perilous visit to the crater of Vesuvius during an eruption, and an interview and metaphysical discussion at Paris with the aged Malebranche.

On his return to Ireland in 1721 he was distressed by the symptoms of social corruption and disorder occasioned by the South Sea Mania. This was the beginning of his public career as a missionary-philanthropist in pursuit of ideals for society. His sociological thoughts first found

expression in a short *Essay towards preventing the Ruin of Great Britain*, charged with suggestions economical and ethical, significant of his own chivalrous indifference to wealth. In 1724 he resigned his fellowship in Trinity College, on being made Dean of Derry, with an income of £1100, which put him for the first time in easy circumstances. Yet that very year he carried to London a letter from Swift to Lord Carteret, the lord-lieutenant of Ireland, bearing that it was 'to introduce an absolute philosopher with regard to money, titles, and power, who for three years past has been struck with the romantic notion of founding, by a charter from the crown, a college at the Bermudas for the Christian civilisation of America, where he exorbitantly proposes a whole hundred pounds a year for himself as its head, and whose heart will break if his deanery be not for this purpose taken from him.' With a foresight of our vast colonial empire, he laboured in London for three years to interest Sir R. Walpole and other leading politicians in this missionary project, the grandest conceived in the 18th century. At last £20,000 was voted by the House of Commons for the endowment. On the faith of this he sailed for America in September 1728, taking with him a congenial auxiliary in his newly-married wife. To prepare for Bermuda, he made a romantic temporary home for himself for nearly three years in Rhode Island, where a few years before some American missionaries had settled. In one of them, a Dr Samuel Johnson, he found congenial companionship and a philosophical disciple, whose works, as well as those of Jonathan Edwards, helped to propagate his metaphysical conception of matter in America. Berkeley never reached Bermuda, as the promised grant was in the end withdrawn. In the autumn of 1731 he returned to England, carrying with him literary fruit ripened in Rhode Island, in 'the still air of delightful studies,' and given to the world in 1732 under the title of *Alciphron, or the Minute Philosopher*, the most finished of his works, with pleasant pictures of American scenes and life, while in form and ideas it resembles dialogues of Plato. Its philosophy cannot be out of date as long as agnostic contention with personality in man and God is continued. *Alciphron* was followed in 1733 by a *Vindication* of Berkeley's early visual immaterialism. In the *Analyst*, published in 1735, his theological philosophy was further unfolded, in an argument meant to show that the higher mathematics involve assumptions which as truly exclude definite or exhaustive conception as do any of the mysteries of religion, and which equally with the latter illustrate the spiritual fact, that the ultimate or marginal conceptions of an intelligence like ours must be only half-conceived truths.

Meantime, in 1734, Berkeley was made Bishop of Cloyne, in the south of Ireland, where in a beautiful home-life of eighteen years he found a channel for his ardent philanthropy in devotion to the social problems of Ireland. Two years after he went to Cloyne, he began the publication of the *Querist*, which appeared, in that and the two following years, in three instalments, consisting of about five hundred questions suggested by Ireland, with 'more hints, than original, still unapplied, in legislation and political economy than are to be found in any equal space.' The *Querist* was followed, in succeeding years, by other pamphlets on Ireland, and appeals for a larger toleration of its religious differences. The medical virtues of tar-water, on which he had been experimenting, were characteristically connected in Berkeley's mind with the ultimate conceptions of religious philosophy. In 1744 he published *Siris*, or a chain of philosophical reflections on the virtues of tar-water, a treatise which he said cost

him more research and thought than any of his other works. Through the crude mechanics, chemistry, and physiology of a past age, it suggests a connection between the resinous element in tar and the Spiritual Power by which the universe is being perpetually created. Plato and the Neo-Platonists, the companions of his advancing years, appear here as his authorities, and throw into the background Locke and the empirical teachers of his youth. In *Siris* he traces the steps by which, at the dawn of the Christian era, Greek and Græco-oriental speculation sought to rise towards the Infinite and Ineffable, and to connect the sensible world and the embodied spirits of men in an intellectual unity in the Divine Reason.

The beautiful home-life at Cloyne ended in 1752, when declining health hastened the execution of a long-formed project to resign his episcopate and make Oxford the home of his old age. Six months after he had reached Oxford, on the 14th of January 1753, he suddenly passed from the world of sense. His body was buried in the cathedral of Christ Church.

Berkeley's life has been one of the principal forces in modern philosophy. His thought has indeed been for the most part only unconsciously operative, beneath the shock and sense of strangeness with which, interpreted as an absurd paradox, it has been popularly received. But it is at the root of all the great conflicts of ultimate speculation about the universe in the 18th and 19th centuries. David Hume, looking only at what Berkeley denied, so misapplied the 'new principle' as to disintegrate spirit as well as matter into a succession of isolated feelings; although Berkeley had really resolved even matter, not into isolated feelings, but into a continuous presentation of significant sense phenomena. Reid and the Scottish psychologists were roused to attempt a deeper and truer psychology than Locke's by the desire to refute the Berkeley they saw in Hume. English and French empirical psychology, from Hartley and Condillac to John Stuart Mill and Comte, has accepted the phenomenalist theory of matter, but emptied of the originating and directing Reason which in Berkeley's thought was its philosophically necessary constitution. In Germany, Kant told that he was roused into philosophical criticism from his 'dogmatic slumber' by the metaphysical nescience which Hume had discovered in his one-sided Berkeley; and the Kantian criticism has formed the European thought of the 19th century, as Lockian psychology formed it in the 18th, and the dogmatic constructions of Cartesianism in the 17th. The abstract self-consciousness of Neo-Kantianism has a certain affinity with the Neo-Platonic idealism of *Siris*—not yet sublimated into Hegelian abstractness in Berkeley's concrete spiritualism, which recognises Reason as at once personal and supreme. It is thus a fact of history that Berkeley has employed the modern philosophical world in a struggle, virtually about his new conception of the universe, which has lasted for nearly two hundred years.

Berkeley's writings are collected in the Clarendon Press edition (4 vols. Oxford, 1871; new ed. 1901), annotated, with prefaces, dissertations, and a Life by the author of this article, who also published *Selections from Berkeley* (1881; 5th ed. 1899), and two smaller works on him (1881-1909). See also Seth, *English Philosophers* (1912); Sorley, *History of English Philosophy* (1920).

Berkeley Sound, next to Stanley Sound the most frequented inlet of East Falkland, near its north-eastern extremity. Though it is difficult to enter, yet it contains several excellent harbours.

Berkhampstead, GREAT, an urban district of Hertfordshire, on the small river Bulburn, 28 miles

NW. of London. Straw-plaiting is carried on; and there are manufactures of wooden articles and chemicals. The poet Cowper was a native. Pop. 7300.

Berkovitza, the chief town of a district in western Bulgaria, 40 miles NNW. of Sofia, on a small tributary of the Danube; pop. 6000.

Berkshire, a midland county of England, bounded N. by Gloucester, Oxford, and Bucks, E. by Oxford and Bucks, SE. by Surrey, S. by Hampshire, and W. by Wiltshire. Its greatest length is 53 miles; its greatest breadth is 30; and the area is 725 sq. m., or 463,830 acres, nearly one-half of which is under tillage, one-fourth in pasture, and one-sixteenth in wood. Berkshire, which is one of the most beautiful of the English counties, lies in the valley of the Thames, and has an undulating surface, rising in some parts into hills. Solid chalk underlies the whole area. A range of chalk-hills, or downs, connected with the Chilterns on the east and the Marlborough Downs on the west, crosses the county into Wiltshire, from Reading to Wallingford, attaining at White Horse Hill (so called from the gigantic figure of a horse rudely defined in the chalk—a relic of ancient times) a height of 893 feet. Between this range—the west part of which is occupied by sheep-walks—and a smaller oolitic one skirting the valley of the Thames, is the Vale of the White Horse, the richest part of the county, and drained by the Ock. To the south of the Downs is the fertile Vale of Kennet, drained by the river of that name, and its feeder, the Lambourn. To the east is the forest district, comprising Windsor Forest, part of Bagshot Heath, &c. The forest chiefly consists of hazel, oak, beech, ash, and alder. The Thames skirts the whole north border of the county, winding through a course of 100 miles, but in a direct line only 52, and navigable nearly the whole way. It is the chief river of Berkshire, the other rivers of the county being its tributaries; of which the chief are the Kennet, Loddon, and Ock. The Kennet is navigable for 30 miles. The climate of Berkshire is very healthy, being mild in the valleys, and bracing on the high lands. The soil varies greatly; in the valleys it is generally a fertile loam, with a subsoil of chalk, gravel, or clay. The country between the valleys of Kennet and the White Horse consists chiefly of sheep-walks; and along the Thames, and to the west of the Ridge Way, or Downs, it is chiefly dairy and pasture land. The chief crops are oats and wheat. 'Double Gloucester' and 'pine-apple' cheese are sent in large quantities to London. Swine are extensively reared, especially near Faringdon, the breed being one of the best in England. Property is very much divided, and the number of gentlemen's seats is very great. The farms are generally of moderate size. The county is traversed by the Great Western Railway and its branch lines, and by two canals. It returns three members to parliament, one for each of the three divisions (Abingdon, Newbury, Windsor), besides one for the county borough of Reading (the county town). Till the Redistribution of Seats Act of 1885, the boroughs of Wallingford and Abingdon also elected members, and till 1918 Windsor. The county contains besides these the municipal boroughs of Wokingham, Newbury, and Maidenhead, the urban district of Wantage, and the market-towns of Faringdon, Hungerford, East Ilsley, and Lambourn. The chief manufactures are noticed under READING. The British and Roman remains are numerous, including Roman roads, and many camps and barrows. Of the old castles, the principal is Windsor; of monastic establishments, the abbeys of Abingdon and Reading. The churches

are small, and, from the scarcity of building-stone, are often constructed of chalk and flint. There are many Norman churches, erected in the 12th and 13th centuries. In 1836 Berkshire was transferred from the diocese of Salisbury to that of Oxford. Pop. (1801) 110,480; (1911) 271,009; (1921) 294,807. See Vincent's *Highways and Byways in Berkshire* (1907), and the 'Victoria History' (1906-12).

Berlad (Rumanian *Bârladu*), a town of Lower Moldavia, on the Berlad River, 40 miles above its junction with the Sereth. It is an important place, connected with Braila by rail, and has a brisk trade. Pop. 25,000.

Berlen'gas, a group of rocky islands in the Atlantic Ocean, off the west coast of the Portuguese province of Estremadura.

Berlichingen, GÖTZ VON. See GÖTZ.

Berlin', the capital of Prussia, and, since 1871, of the German reich (as empire and as republic), the seat of the German Reichstag and Prussian Landtag, and the largest city of continental Europe, is situated on the Spree, in 52° 30' N. lat., 13° 24' E. long. The city is built upon a flat sandy plain, which, though cultivated, is far from being fertile. Its average height above the level of the Baltic is only 100 feet, and its mean temperature is 48° F. The Spree, here about 200 feet wide, with a current so sluggish as scarcely to be perceptible, flows from SE. to NW. through the city, dividing it into two nearly equal parts, and communicating with the Oder and the Baltic by canals. The inconvenience of its low-lying situation in the midst of the sandy flats of Brandenburg is more than made up for by the great geographical advantages of its position in the heart of northern Germany, Berlin being half-way from Hamburg to Breslau, from Stettin to Leipzig, and from Memel to Alsace, from the mountains of central Germany to the Baltic, and within convenient distance of the frontiers of Poland and Holland. The advance of the city has been extraordinary. In 1804 the pop. was 182,157; in 1858 it was 438,961; in 1871 it was 826,341 (including 20,565 soldiers); in 1880, 1,122,330; and in 1885, 1,315,287, the city covering at that date an area of 15,500 acres, and measuring about 6 miles across. In 1900 it had 1,888,848 inhabitants; in 1910, 2,071,257. War had reduced the population to 1,902,509 in 1919. In 1920, however, seven suburban towns and a number of other districts were formed with Berlin into a single commune, with an area of over 877.6 square kilometres and a population (1919) of 3,803,901. Berlin thereby became a city of slightly greater area than New York, or nearly three times that of the county of London, stretching to, but not including, Potsdam. The towns absorbed in 1920 were Charlottenburg, Neukölln, Berlin-Schöneberg, Berlin-Lichtenberg, Berlin-Wilmersdorf, Spandau, and Cöpenick.

As far back as the 13th century the central part of the present city was inhabited. *Kölln*, on the island formed by the Spree on its left bank, was united to *Old Berlin* on the right bank in 1307. These names are still retained by the corresponding quarters of the modern city. The Wendish *köllen* means 'a hill rising above water or swampy ground,' and *Berlin* is most probably to be traced to the root of *wehr* (English *weir*), 'a dam in a river.' Berlin was long little more than a fishing-village; it was not till the 'Great Elector,' Frederick-William (1640-88), had united the separate duchies of which Prussia is now formed that the town became of consequence as the capital of a large state. In the next century it received accessions of French and Bohemian colonists, driven into

exile by religious persecution. Every inducement was then held out to bring foreigners to settle in the rising city. Under Frederick the Great it continued to prosper. At his death the inhabitants numbered 145,000. After the peace of 1815 Berlin increased with extraordinary rapidity, and, being the seat of government, a focus of the arts and sciences, and a great centre of commercial enterprise, it has gradually risen to a position which fairly entitles it to its present rank as the metropolis of the German republic.

The centre of the city is now devoted almost exclusively to commerce. The bulk of the houses are built of brick, plastered or stuccoed outside. Before 1864 most of them were of one, two, or three stories, but these fast gave way to houses of a larger size. The increase in the value of house-property was enormous. Berlin contains a large number of very fine buildings. At the centre of the city is the former royal palace, with nearly 700 apartments, including the richly adorned state-rooms, the finest of which are the magnificent 'Weisser Saal' and the palace chapel. Near this are the palaces which were occupied by William I. and by Frederick III. as crown prince; the old and new museums, the national gallery, the arsenal, the theatre, the opera-house, the guard-house, and the university. These are all situated between the Spree and the east end of the street 'Unter den Linden' (so called from its double avenue of limes, not unmixed with other trees), one of the finest streets in Europe, about a mile long, and almost 150 feet broad. The Prussian State Library (which has over 1,750,000 volumes and 50,000 MSS.) was in 1914 (as the Royal Library) removed from this neighbourhood to a building on the north side of Unter den Linden, in which are housed also the University Library and the Academy of Sciences. A continuation of Unter den Linden, beyond the Opernplatz, Lustgarten, and Kaiser-wilhelmsbrücke, cuts through the old town on the other side of the Spree. The other chief streets are Friedrichstrasse (2 miles long), Leipzigerstrasse, Königstrasse, and Wilhelmstrasse, in which are the president's palace, which formerly housed the ministry of the royal house, and the chancellor's, where the Congress of Berlin sat in 1878. The city is adorned throughout with numerous statues of national heroes, the statue of the Great Elector and the equestrian statue of Frederick the Great being the most remarkable. There are more than 20 theatres in Berlin. Berlin has numerous classical and other gymnasia, higher boys' and higher girls' schools, middle and elementary schools. The university, though only established in 1809, has taken a distinguished place among the universities of the world. Among its professors have been Fichte, Hegel, Schelling, Schleiermacher, Eichhorn, De Wette, Wolf, the Grimms, Niebuhr, Savigny, Neander, Bopp, Ranke, Curtius, Lepsius, Mommsen, Dörner, Virchow, Du Bois-Reymond, Helmholtz, Hofmann, Sybel, Van't Hoff, Harnack, Treitschke, Fischer, Einstein. The number of professors and lecturers is now about 600, and of students about 12,000. It possesses a large library. Of other institutions may be mentioned the Academy of Sciences, by far the most important of the kind in Germany; the Military Academy; the Academy of Architecture; the Academic High School (of art); the School of Mines; the School of Agriculture; the Technical and Engineering Colleges; the Industrial (1881), Ethnological (1886), and other museums; the Academy of Music; the Observatory; many scientific and learned societies; several seminaries for teachers and missionaries; and a large number of public and private institutions and societies for benevolent purposes. Of the numer-

ous hospitals in Berlin, the Charité (adjoining which is the Pathological Institute, long guided by Virchow) is the largest in Germany. About 88 per cent. of the population are Protestants, 7 per cent. Roman Catholics, and 5 per cent. Jews. The cathedral was rebuilt in 1893-95. Of other Protestant and Catholic churches, the Nicolaikirche (restored in 1880), Marienkirche (with a spire 295 feet high), and Klosterkirche, all of the 13th century, are the oldest; the Petrikerche (with a tower 315 feet high) is the loftiest; and the Michaelskirche (Catholic), Thomaskirche, Zionskirche, Dankeskirche, and Heiligeckeskirche are among the finest. The Synagogue (1866) has a richly decorated interior, a gilded dome 158 feet high, and seats for 3000 persons.

The Old Museum includes antiquarian objects, a great collection of coins, a gallery of ancient sculpture, and an extensive picture-gallery. The New Museum contains six magnificent mural paintings by Kaulbach in the grand staircase, a very extensive and valuable collection of casts, the Egyptian museum, and a fine and very numerous collection of engravings. The National Gallery contains works by modern artists. The celebrated Brandenburg Gate (erected in imitation of the Propylæa at Athens, 65 feet high and 205 feet wide) leads from Unter den Linden and the Pariser Platz to the Tiergarten, a park of 370 acres (with the monument of Friedrich-Wilhelm III., and those of Goethe and Queen Luise, both erected in 1880). To the south-west of this lies the Zoological Garden, which has been considerably extended. The Botanical Garden is at Schöneberg. Noteworthy also are the Rauch Museum in the Lagerhaus (the oldest secular building in the city), the Rathaus, the Aquarium, the eight marble groups on the Schlossbrücke, the château of Monbijou (with the Hohenzollern Museum), the Ruhmeshalle in the arsenal (beautifully rebuilt in 1883), the monuments of Stein, of Calvin, of Schiller (before the theatre), and of the Humboldts (in front of the university), the Gothic monument on the Kreuzberg, the Column of Peace in the Belle-Alliance-Platz, the Warriors' Monument, and the Column of Victory, 200 feet high, erected in the Königsplatz in commemoration of the great victories of 1864, 1866, and 1870-71, near which are the War Office and the Reichstag building (the latter, with four towers and a cupola, built in 1884-94), and Reinhardt's Grosses Schauspielhaus by Pölzig (near the north end of Friedrichstrasse).

The commerce and manufactures of Berlin have increased so rapidly that it now ranks among the most important mercantile places of continental Europe. The traffic is carried on by the Spree, the canals, and railways, of which the intra-mural or 'city railway,' opened in 1882, passes through the middle of the city from east to west, and the suburban or 'ring railway,' 23 miles long, forms a complete circle round its outskirts. The geographical position of Berlin makes it a great emporium for agricultural products coming from East Prussia, Russia, and central Europe. The traffic by water is much greater than that of any other inland town of Germany. The staple commodities are grain, cattle, spirits, timber, coal, and wool. The Exchange is the centre of the North German money-market. The Reichsbank is the chief bank in Germany for the issue of notes. The principal branches of industry are woollen-weaving, calico-printing, and the manufacture of engines and other machinery, also of iron, steel, and bronze wares, drapery goods, and confections. Berlin has also very important manufactures of railway and other carriages, sewing-machines, safes, telegraphic apparatus, scientific instruments, chronometers, steel pens, and jewellery. Of the other industries of

Berlin the chief are its manufactures of pianofortes, accordions (of which it is the main source of supply for the foreign trade), and other musical instruments; hardware, German silver, lamps, and metal toys; leather, paper, rubber, soap, and chemicals; furniture, carpets, porcelain, and other earthenware; gloves, linen articles, straw-hats, and artificial flowers. Great quantities of beer are brewed. There were in 1900 some 5000 factories of all kinds, employing over 175,000 persons. In respect of its publishing trade, Berlin now shares with Leipzig the first rank amongst German cities. Formerly the sanitary condition of Berlin was very bad; the river was polluted, and open drains ran through the streets. But since 1870 the corporation has spent freely on public health, and Berlin municipal arrangements have become a model to many other cities. Still nominally part of Brandenburg, Berlin is virtually a province, the only link left being the common Oberpräsident. The governing body (since 1920) consists of thirty salaried members, with an Oberbürgermeister, and an assembly of 225 members. For local purposes there are twenty municipalities, each with its own governing body.

See the articles CHARLOTTENBURG, SPANDAU, &c.; J. Pollard, *A Study of Municipal Government: The Corporation of Berlin* (1894); and books on Berlin by Vize-telly (London, 1879), Ring (1883), Friedel (1882), Baedeker (new ed. 1912), Bormann (1892), Lampe (1909), and Goldschmidt (1910).

THE CONGRESS OF BERLIN met at Berlin in June 1878, and consisted of representatives of Russia, Turkey, Germany, Great Britain, France, Austria-Hungary, and Italy. It was primarily designed to revise the preliminary treaty of San Stefano, concluded by Russia and Turkey after the war of 1877-78, and the treaty of Berlin began a new era in the history of the Ottoman empire. Rumania, Serbia, and Montenegro were recognised as independent, the latter states receiving additional territory. The concession of additional territory to Greece was recommended (and made, 1881). Rumania received the Dobruja in compensation for Bessarabia, given to Russia. Ardahan, Kars, Batum, and other parts of Armenia were ceded to Russia by Turkey. Turkey engaged to carry out reform in Asia Minor and Crete. Bulgaria became an autonomous but tributary principality, and Eastern Rumelia (which was practically united to Bulgaria after the war with Serbia in 1885), though remaining under the direct political and military authority of the sultan, secured administrative autonomy and the right to have a Christian governor-general. Bosnia and Herzegovina were to be occupied and administered by Austria-Hungary. Prince Bismarck was president of the Congress, and the Earl of Beaconsfield and the Marquis of Salisbury were the English plenipotentiaries.

Berlin, or KITCHENER, a town of Ontario, Canada, 62 miles SW. of Toronto by rail; pop. 15,200.

Berlin, (1) a city of New Hampshire, on the Androscoggin River, 98 miles by rail NW. of Portland, has manufactures of paper, pulp, and lumber, for which it uses the water-power of Berlin Falls; pop. 16,000.—(2) A city of Wisconsin, on the Fox River, 97 miles by rail NNW. of Milwaukee, has extensive industries; pop. 4400.

Berlin, ISAIAH (1725-99), a Breslau rabbi, a critical student of the Talmud.

Berlin, JOHANN DANIEL (1710-75) composer, born at Memel, was organist at Trondjem.

Berlin Decree. See CONTINENTAL SYSTEM.

Berlinghieri, ANDREA VACCA (1772-1826),

surgeon, born at Pisa, lectured on surgery there, and wrote on lithotomy, &c.

Berlin Spirit, a coarse whisky made chiefly from beet-root, potatoes, &c. Because of its cheapness it has been largely used in the making of brandy, and in fortifying cheap unwholesome wines. The effect upon the consumer is pernicious. See BRANDY, DISTILLATION, WINE.

Berlioz, HECTOR, a musical composer of remarkable but eccentric genius, was born December 11, 1803, at Côte-St-André, in the department of Isère, France, where his father was a physician. Against the wishes of his parents, who intended him to pursue the same profession, and sent him to Paris to study medicine, he devoted himself to music, entering the Conservatoire as a pupil of Lesueur. Amid severe privations—for his father had cut off his supplies—Berlioz continued his musical education, winning the second prize in 1828, and the first, or *Grand prix de Rome*, in 1830, with a cantata entitled *Sardanapalus*. In accordance with the conditions attached to this prize, Berlioz now went to Italy, where he resided for upwards of a year, and became acquainted with Liszt and Mendelssohn. The artistic surroundings of his life in Rome, however, were profoundly distasteful to him, and his sojourn was not marked by much creative work. After his return to Paris, in the year 1832, Berlioz soon brought some of his compositions to a hearing; but their complicated and peculiar nature failed to win popular recognition, and Berlioz was driven to support himself and his wife—he married the Irish actress, Henrietta Smithson, in 1833—by writing musical criticisms for various newspapers, an irksome burden from which he only freed himself at the close of his life. In this work, often wrung from him with the utmost pain and effort, are revealed those remarkable gifts of style, of picturesque expression, and of humour, which render his letters and his memoirs such admirable reading. When occasion offered, Berlioz also adopted the precarious livelihood of a concert-giver. In 1838 Paganini was so much impressed by a performance of the *Symphonie Fantastique* that he presented, or became the medium for presenting, Berlioz with the sum of 20,000 francs. In 1842 he set out on the first of those foreign concert tours which more than anything else indemnified him for the indifference of his compatriots. More than once he was offered a post in Germany, but could not make up his mind to tear himself away from Paris. In the course of these journeys Berlioz visited and was received with almost uniform enthusiasm in Belgium, Germany, Austria, Bohemia, Hungary, and Russia. In 1848 he was engaged by Jullien as conductor at Drury Lane, but the enterprise proved a disastrous failure. In 1855 he fulfilled another engagement in London as conductor of the New Philharmonic Society. It is pleasant to think that Berlioz, who was much attached to England, and had a profound veneration for Shakespeare, has owed the posthumous rehabilitation of his fame chiefly to the efforts of musicians resident in that country. Sir Charles Hallé, a friend of Berlioz's earlier years, produced his *Damnation de Faust* at Manchester in 1880, since which time it has made its way into the *répertoire* of all the chief choral societies of the kingdom; and Sir A. Manns, at the famous Saturday concerts of the Crystal Palace, was equally assiduous in familiarising English audiences with the colossal masterpieces of the French composer. Between 1855 and 1869, in which year Berlioz died, the course of his life presents no special features. He had practically abandoned composition, the only

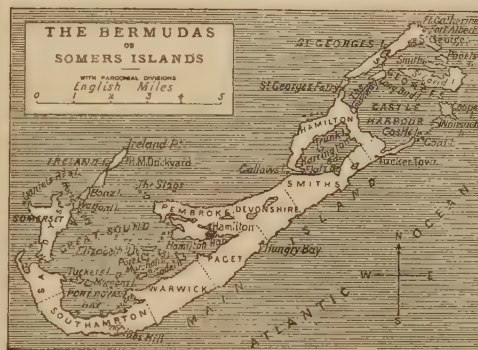
work produced in this period being his opera *Les Troyens*, performed with moderate success in 1863. The complete list of Berlioz's works is comprised within the limits of twenty-six *opus*-numbers; but this scanty array affords no clue to the magnitude of their dimensions. After his *Faust*, which is, perhaps, deservedly his most popular work, his most successful achievements are his symphonies, *Roméo et Juliette*, *Harold en Italie*, and the *Symphonie Fantastique*; his overtures, *Carnaval Romain*, *Benvenuto Cellini*, and *Waverley*; his charming opera, *Beatrice et Bénédict*; his sacred trilogy, *L'Enfance du Christ*; and finally, his great *Messe des Morts*—the requiem written for the obsequies of General Damrémont in 1837—and his *Te Deum*, in the *Judeux* of which Berlioz rises to his greatest height. A great deal of Berlioz's best literary work is buried in the files of the *Débats*; but his published writings amount to several volumes, including his *Soirées d'orchestre*, *À travers Chants*, *Les Grotesques de la Musique*, his *Mémoires* (published in 1865), and finally, his well-known treatise on orchestration, which has been translated into English, and is a standard work on the subject. The characteristics of Berlioz's compositions are too remarkable to be discussed in a brief summary. His conceptions were grandiose rather than great, and in carrying them out he sometimes narrowly escaped an abrupt lapse from sublimity to bathos. He delighted overmuch in extravagantly exciting effects; but his sense of orchestration was so abnormally acute that, as an English critic has observed, no matter what the effect was, it was sure to sound exactly as he intended it. In delicate orchestral embroidery he stands alone—witness the 'Queen Mab' scherzo in his *Roméo et Juliette*, and the accompaniment to the chorus of spirits of the air in *Lélio*. Though accused of being a revolutionary in music, he entertained the most touching and enthusiastic reverence for Beethoven, Weber, and Gluck. Of an imperious and uncompromising disposition in his official and professional relations, he was nevertheless on terms of close intimacy with a great number of his contemporaries, amongst whom may be mentioned Liszt, Heine, Balzac, Stephen Heller, and Ernst. Schumann at once recognised his great talent, and published eulogistic analyses of his works in the *Neue Zeitschrift für Musik*. Berlioz was made a chevalier of the Legion of Honour in 1839, and was elected a member of the Institute at Paris in 1856. He died 8th March 1869.

See the books on Berlioz (pronounced *Ber-le-ōz*) by Jullien (1888), Hippeau (1883 and 1892), Pohl (1884), Thompson (1895), Tiersot (1904), and Lives compiled from his own Letters and Memoirs by the Misses Holmes (1884), Mainwaring Dunstan (1882), and Miss Boulton (1904).

Bermondsey, on the south bank of the Thames, is a metropolitan and parliamentary borough; pop. 119,000. See LONDON.

Bermuda, or **SOMERS' ISLANDS**, a British possession in Mid-Atlantic, so named respectively from Bermudes, a Spaniard, who first sighted the islands in 1515, and from Sir George Somers, an Englishman, whose shipwreck here in 1609 was the immediate occasion of their being colonised from Virginia—itself only four years old—in 1611. This low and lonely archipelago is a mere group of specks; for though it numbers perhaps 100 islets and more than twice that number of rocks, yet it measures only about 12,000 acres in all, the whole occupying a space of about 14 miles in length by little more than 5 in breadth. The islands are composed of blown coral sand, and are surrounded by a living, growing reef of coral, the whole being

a modified Atoll (q.v.), and the most northerly of such structures. The great value of this natural fortress as a British naval station, defended by its extensive barrier of reefs and rocks, with only one or two intricate channels, arises from its situation. In 32° 15' N. lat., and 64° 51' W. long., the Bermudas occupy, commercially and politically, a singularly commanding position. At a distance of 580 miles from Cape Hatteras, in North Carolina, they are about equally remote from the north of Maine and from the south of Florida; while they are a connecting link between Canada and the British West Indies. In the principal or Main Island is situated the present seat of government, Hamilton, on a deep inlet running 2 or 3 miles into the land. St George's, the island next in importance, contains the picturesque town of the same name, and a land-locked harbour, the entrance to which is defended by strong batteries. Ireland



Island is entirely occupied by H.M. Dockyard and other naval establishments; and Boaz and Watford Islands have the military depôts and garrisons. The famous Floating Dock towed from England in 1869 (381 feet x 124 feet) was superseded by a new one (545 feet x 100 feet), without gates, towed out in 1902, capable of dealing with cruisers like the *Terrible* and ships like the *Campania* (see DOCK). The minor islands of St David, Cooper, Smith, Nonsuch, Godet, and others, form numerous picturesque creeks and bays of great size and depth, such as the Great Sound, Castle Harbour, Harrington Sound, and others. Most of the other islands are insignificant, many of them without name or inhabitant. The group forms an almost continuous chain, and, with one break, there is uninterrupted communication by roads, causeways, and bridges for a distance of about 22 miles; but from the strange shapes of most of the islands, and the number of spacious lagoons, the communications are almost as necessarily by water as are those of Venice. The climate is tempered by an almost constant sea-breeze, and the air is moist at all seasons. The thermometer never falls below 40° F., and seldom rises above 85°. The annual rainfall is 52 or 53 inches. The islands are becoming a popular holiday and winter resort, especially for Americans; and both Hamilton and St George's are plentifully supplied with hotels and shops. The climate, however, is not suited for consumptive invalids. The soil is poor in quality, and not more than a third is cultivable at all; but there being no winter frosts, crops can be prepared for March, April, May, or June, and the large quantities of early potatoes, onions, tomatoes, and other garden vegetables, which in these months fetch high prices at the New York markets, enable the Bermudians to live comfortably on the income of their comparatively small portions of ground.

Sweet potatoes, arrowroot, and bananas are also largely grown; and the islands produce vast numbers of lily-bulbs, which are shipped to the United States, and kept in hot-houses till they can be planted out later. The fisheries are productive. Almost all the export produce goes to the United States and to Canada, and thence the food-supplies of the islands (grain, flour, rice, live-stock, &c.) are mainly supplied. There is frequent steam communication with New York. Bermuda is an important naval base, with dockyard and victualling establishments. The population, only 12,150 in 1871, had by 1920 (not including the garrison) increased to about 22,000, of whom only 7500 were whites. Till 1862 Bermuda was a convict station. The islands received representative institutions by royal charter in 1627, and are under the authority of a governor and executive council of 6 members appointed by the crown; a legislative council of 9 members also appointed by the crown; and an assembly of 36, four of whom are elected by each of the nine parishes. Hamilton (pop. 2600) and St George's have each a mayor, aldermen, and councillors. St George's has developed as a bunkering port. In September 1899 an unusually severe cyclone visited the 'still vexed Bermoothes'—of which Bermuda is now the accepted spelling. More than half of the population belong to the Church of England, under the Bishop of Newfoundland and Bermuda.

See works on Bermuda by Lefroy (1882), Ogilvy (1883), Dorr (1884), Stark (1884), Heilprin (1890), Newton (1897), and Bell (1902); the colonial reports; and the annual local guide and directory.

Bermudez, a state in the NE. of Venezuela, between the Orinoco and the Caribbean Sea, formed in 1881 from the states of Barcelona, Cumana, and Maturin. It was broken up in 1901, reconstituted in 1904, and again broken up in 1909.

Bermudez, LAKE, an asphalt lake in north-eastern Venezuela, some 30 miles from the coast, is approached by ships by the Gulf of Paria and the San Juan River. It is about 3 square miles in area, much shallower (at least where it has been worked) than the Trinidad lake, is richer in bitumen, and is more covered with water, mud, and vegetation.

Bern, or **BERNE**, a Swiss canton, bounded on the N. by France. It is the most populous, and next to the Grisons the most extensive, its area being over 2650 sq. m., and its population 674,000—more than one-sixth of the Swiss people. About 11 per cent. are Roman Catholics. The fertile valleys of the Aar and the Emmen divide the mountainous Alpine region in the south from the Jura Mountains in the north. The Bernese Oberland, or Highlands, comprises the peaks of the Jungfrau, Mönch, Eiger, Schreckhorn, Finsteraarhorn, &c., and the valleys of Hasli, Lauterbrunnen, &c. The lakes of Thun, Brienz, Neuchâtel, and Bienne are in the canton, which is watered by the Aar and its several tributaries. The climate is generally healthy. The plains of the Aar and the Emmen are the most fruitful, producing corn and fruits of various kinds, and affording excellent pasturage for cattle, which, with dairy-produce, form the chief agricultural wealth of Bern. The vine grows in some districts. The horses of the Emmenthal are much prized. The lakes abound with salmon and trout. Iron-mines are worked, and a little gold is found, and quarries of sandstone, granite, and marble are abundant. Its manufactures, which are not extensive, consist chiefly of linen, coarse woollens, leather, iron, and copper wares, articles of wood, and watches. Bern entered the Swiss Confederation, in which it now holds the second rank, in 1352. In the 15th and 16th centuries, it

added to its possessions Aargau and Vaud, which it lost during the wars of the first Napoleon; but it received in return Bienne and its territory, and the greater part of the bishopric of Basel. The present constitution of the canton, proclaimed in 1874, but based on the laws of 1848, is one of representative democracy.

Bern, or **BERNE**, capital of the above canton and of Switzerland, is situated on a lofty sandstone promontory formed by the winding Aar, which surrounds it on three sides, and is crossed by several bridges, one of which is an imposing iron structure of 1883, 751 feet long, and 115 high. Bern is 68 miles by rail SSW. of Basel. It is one of the best and most regularly built towns in Europe, as it is the finest in Switzerland. The houses are massive structures of freestone, resting upon arcades, which are lined with shops, and furnish covered walks on both sides of the street. Rills of water flow through the streets. The view of the Alpine peaks from the city is magnificent. The principal public buildings are a Gothic cathedral (1421–1573), whose restoration and completion was undertaken in 1887; the magnificent Federal Council Hall (1857), the mint, the hospital, and the university. Bern has an interesting museum and a valuable public library. The manufacturing industry is trifling, and consists chiefly of dress fabrics and hats; but there is a considerable trade in the produce of the surrounding district. Population, 105,000. Bern was founded in 1191, was made a free imperial city in 1218, under Frederick II., and gradually extended its possessions until it became an independent state; and between 1288 and 1339 successfully resisted the attacks of Rudolf of Hapsburg, Albert his son, and Louis of Bavaria. The 'Disputation of Bern' between Catholics and Reformers in 1528 (January 6–27) prepared the way for the acceptance of the reformed doctrine. Bern is the residence of foreign ministers, and, since 1849, the permanent seat of the Swiss government and diet. On account of the traditional derivation of its name (old Swabian *bern*, 'a bear'), bears have for several centuries been maintained in Bern, and the bear-pit is still one of the 'sights' of the city. For the Bern Convention, see COPYRIGHT. For Dietrich of Bern (that is, Verona, not Bern in Switzerland), see THEODORIC.

Bernadotte, the French Napoleonic officer who became king of Sweden as Charles XIV. (q.v.).

Bernard, GREAT ST. See ST BERNARD.

Bernard, CLAUDE, a great French physiologist, born at Saint-Julien, near Villefranche, 12th July 1813. He studied medicine at Paris, became a hospital-surgeon in 1839, and two years later assistant at the Collège de France to the great physiologist Magendie, with whom he worked for thirteen years, until his own appointment in February 1854 to the chair of General Physiology. The same year he was chosen member of the Academy of Sciences, and in 1855 he succeeded to Magendie's chair of Experimental Physiology. Bernard was elected to the Academy in 1868, and died at Paris, February 10, 1878. His funeral was conducted at the public expense, an honour never before given to a man of science, and his *éloge* at the Academy fell to Renan. As an original investigator, Bernard stands among the foremost of the century. His earliest researches were devoted to the physiological action of the various secretions of the alimentary canal. His proof that the sole use of the pancreatic juice in the digestive system is so to modify the ingested fats as to render them capable of being absorbed by the chyle ducts, is a masterpiece of biological demonstration. Another important discovery established the saccharine function of the

liver. Still more important was his demonstration of the connection between this function of the liver and the nervous system. He showed that the normal formation of sugar in the liver could be totally interrupted by severing the pneumogastric nerve in the neighbourhood of the heart, and moreover, that by a wound made on the floor of the fourth ventricle of the brain, an abnormal formation of sugar could be immediately induced—a great contribution to our knowledge of the pathology of diabetes. For these great discoveries Bernard received the physiological prizes of the French Academy in 1851 and in 1853. Later researches were on the change of temperature of the blood in its passage from one organ to another; on the absorption of oxygen by the blood, and the respective amount of it in arterial and in red and black venous blood; on the comparative properties of the opium alkaloids; on the poisonous properties of curarine; and on the sympathetic nerves in general; as well as numerous investigations on the individual processes in the act of digestion. The great experimentalist was a remarkably lucid lecturer, alike in the academic chair and on the platform, and his *Leçons de Physiologie Expérimentale appliquée à la Médecine* (1865) is a standard work far beyond his country. Other books are: *Leçons sur les Effets des Substances Toxiques et Médicamenteuses* (1857), *Introduction à l'Étude de la Médecine Expérimentale* (1865), and *Leçons de Pathologie Expérimentale* (1874). Many of his papers appear in the special scientific journals, and in the *comptes rendus* of the Académie des Sciences and the Société de Biologie, of which last he was a founder and president. See the Life by Sir Michael Foster (1899).

Bernard, St. of Clairvaux, one of the most influential theologians of the middle ages, was born of a noble family at Fontaines, near Dijon, in Burgundy, in 1091; entered the Cistercian monastery of Cîteaux at twenty-two; and became two years later the first abbot of the newly-founded monastery of Clairvaux, in Champagne. He died at Clairvaux, August 20, 1153; and was canonised by Pope Alexander III. in 1174. His ascetic life, solitary studies, and stirring eloquence made him during his lifetime the oracle of Christendom. He founded more than seventy monasteries, and his persuasive earnestness was such that he drew also into the monastic life both his two elder and his two younger brothers, while we are told that mothers hid their sons, wives their husbands, companions their friends, that they might escape the resistless spell of his spiritual enthusiasm. He was honoured with the title of the 'mellifluous doctor,' and he is regarded by the Catholic church as the last of the fathers. Bernard drew up the statutes of the Knights Templars at the request of their grandmaster in 1128. The reverence in which he was held gave him great influence in the political movements of his time. It was due to his persuasion that Innocent II. was recognised at the Synod of Étampes (1131) by Louis VI. of France, soon after by Henry I. of England and the Emperor Lothar of Germany, as pope in opposition to the antipope Anacletus. His influence in Christendom rose to its height under the reign of Pope Eugenius III., his disciple. It was his glowing eloquence at the council at Vezelay in 1146 that kindled the enthusiasm of France for the second crusade. Charged by the pope to excite the religious zeal of the people of France and Germany, Bernard accomplished his mission with fatally memorable success. Fields, towns, cities, and castles were in many places almost depopulated, and thousands of men, fired by his prophetic eloquence, hurried to the East, but few of whom were ever to see their homes again.

The influence of St Bernard as a spiritual teacher through his fervid piety and living grasp of Christian doctrine was a wholesome antidote to the dry and cold scholasticism which prevailed among the churchmen of his age. 'If there ever lived on the earth a God-fearing and holy monk,' says Luther, 'it was St Bernard of Clairvaux.' Yet his Christianity lacked the perfect flower of gentleness, and he was harsh and severe in judging heretics like Abelard. His writings consist of more than 400 epistles, 340 sermons, and 12 distinct theological treatises, edited by Mabillon (Paris, 6 vols., 1667-90), and in Migne's *Patrologia Latina* (4 vols., 1851-52). His life of St Malachy is of special interest to Britons. It is doubtful if 'Jesus, the very thought of thee,' and some other hymns attributed to him, were really his. The hospice and pass of St Bernard (q.v.) are not named after him. The monks of the reformed branch of the Cistercians, reformed by him, are often called, in France, Bernardines. He gave name also in France to the nuns of the Cistercian order, which his sister, St Humbeline, is said to have founded. See Cotter Morison, *Life and Times of St Bernard* (3d ed. 1877), and lives by Ratisbonne, Mabillon, Eales, Storrs (1893), Vacandard (1895), Sparrow Simpson (1895), and Halusa (1898); also the letters translated by Cardinal Gasquet (1904).

Bernard, St. of Menthon, founder of the hospice of St Bernard (q.v.).

Bernard OF MORLAIX, a monk of Cluny about 1140, is said to have been born of English parents at Morlaix in Brittany. He is the author of the remarkable poem *De Contemptu Mundi*, in 3000 long rolling, 'leonine-dactylic' verses, which has been freely translated by Dr Neale as *The Rhythm of Bernard of Morlaix*. From this 'Jerusalem the Golden' and other well-known hymns are taken.

Bernardin de St Pierre. See ST PIERRE.

Bernardines. See CISTERCIANS.

Bernardino, St., of Siena, born in 1380 at Massa-Carrara, of a distinguished family, made himself famous by his rigid restoration of their primitive rule amongst the degenerate order of the Franciscans, of which he became a member in 1404. In 1438 he was appointed vicar-general of his order for Italy. Bernardino was unweariedly devoted in his activity during the great Italian plague of 1400, both as an impressive preacher and an attendant upon the sick and dying. He founded the *Fratres de Observantia*, a branch of the Franciscan order, which already numbered more than 300 monasteries in Italy during his day. Bernardino died in 1444, and was canonised in 1450. His works were eminently mystical. See a Life of him by Thureau-Dangin (translated 1912).

Bernauer, AGNES, the beautiful daughter of a poor surgeon of Augsburg, secretly married, in 1432, to Duke Albrecht of Bavaria, only son of the reigning Duke Ernst. Their happiness was undisturbed, till Albrecht's father, becoming aware of his son's attachment, had the knightly lists shut against him, as one who was living with a woman in licentiousness. Albrecht now made Agnes be openly honoured as Duchess of Bavaria. But in her husband's absence, Duke Ernst had Agnes tried for sorcery, condemned for having bewitched Albrecht, and drowned in the Danube in the presence of the whole people, October 12, 1435. Albrecht took up arms against his father; but after a year of war he was prevailed on to return to his father's court, and ultimately consented to marry Anna of Brunswick.

Bernay, a French town in the department of Eure, 25 miles WNW. of Evreux. One of the

largest horse-fairs in France is held here annually. Pop. 6000.

Bernays, JAKOB, an eminent philologist, born of Jewish parents at Hamburg in 1824, made his studies at Bonn, where he became professor and librarian in 1866, and died, May 26, 1881. Among his numerous books were a *Life of Scaliger* (1855), *Lucian und die Cyniker* (1879), an edition of *Lucretius* (1852), and a translation of three books of Aristotle's *Politics* (1872). His *Gesammelte Abhandlungen* were edited by Usener (1885).

Bernburg, a town in the German land of Anhalt, till 1863 capital of Anhalt-Bernburg, lies on the Saale, 23 miles S. of Magdeburg. Bernburg has manufactures of machinery, sugar, spirits, porcelain, paper, and starch. Pop. 33,000.

Berne. See BERN.

Berners, or BARNES, DAME JULIANA, a writer on hunting and hawking, of whom almost nothing is really known. Tradition has it that she was prioress of Sopwell Nunnery, near St Albans, and daughter of Sir James Berners, who was beheaded in 1388. To her has been generally conceded the authorship of the *Treatyse perteynyng to Hawkyng, Huntynge, and Fysshynge with an Angle*; also a right noble *Treatyse on the Lynage of Coote Armiris*; *endynge with a Treatyse which specyfeth of Blasyng of Armys*; although she probably wrote only the treatise on hunting, and part of that on hawking. The heraldry is certainly not hers. The earliest extant edition, printed at St Albans in 1486, is issued without the treatise on fishing. A fac-simile of this with an introduction by William Blades appeared in 1881. A folio edition was printed by Wynkyn de Worde in 1496, and at least ten more editions appeared before 1600, a testimony to the popularity of the 'Boke of St Albans.' A fac-simile was issued by Haslewood in 1810, discussing how far she was the first woman-writer in English. An edition of the *Fysshynge* was printed by Baskerville in 1827, and another in 1880.—For Lord Berners, see FROISSART.

Bernese Oberland. See BERN.

Bernhard, Duke of Weimar, a celebrated German general, born in 1604, was the youngest of the eight sons of John, third Duke of Saxe-Weimar. On the outbreak of the Thirty Years' War, he took the side of Protestantism, and first distinguished himself in 1622 at the bloody battle of Wimpfen. Subsequently, he became colonel in the army of Christian IV. of Denmark. In 1631 Gustavus Adolphus made his appearance in Germany, and Bernhard was one of the first who flew to his standard. He commanded the left wing at Lützen, and after the king's death had the chief command. He took a very important part in the war; but after a brilliant career, he fell suddenly ill, and died at Neuburg on the Rhine, July 8, 1639. Bernhard's own opinion, and that of others, that he died of poison administered by his physician, who is supposed to have been in the pay of Richelieu, is not supported by evidence. See Droysen, *Bernhard von Weimar* (Leip. 1885).

Bernhardt, ROSINE, called SARAH, a French actress, born of Jewish parents in Paris, October 22, 1844, was baptised into the Christian faith by her father's desire, and brought up in a convent at Versailles. Entering the Paris Conservatoire in 1858, she gained second prizes for both tragedy and comedy, and in 1862 made her début as 'Iphigénie' at the Théâtre Français, but attracted so little notice that she soon left the theatre, only to meet with still less success in burlesque at the Gymnase and Porte St Martin. In 1867 she played minor parts at the Odéon, and became famous by her impersonation of the 'Queen of Spain' in *Ruy Blas*.

and of 'Zanetto' in Coppée's *Passant*. She was recalled to the Théâtre Français in 1872, and after 1879 made annual appearances, with marked success, in London. Her tours in North and South America, in Italy, Russia, &c., were also pecuniarily successful; but her essay at the management of a Paris theatre involved her in heavy debt. In 1882 she was married to M. Jacques Daria or d'Amala, a Greek actor, from whom she was divorced shortly afterwards. Madame Bernhardt is probably the greatest *tragédienne* since Rachel, and in comedy also she ranks as a finished actress. She has written a drama (*Adrienne Lecouvreur*, 1905), and paintings and statues from her studio have appeared in the Salon. See her *Reminiscences* (trans. 1907).

Bernhardy, GOTTFRIED, a German scholar, born of Jewish parents near Frankfort in 1800, was educated at Berlin, and in 1829 became director of the philological seminary at Halle. Here he died, May 14, 1875. Of his numerous philological works may be mentioned his *Syntax der griechischen Sprache* (1829); *Paralipomena Syntaxis Græcæ* (1854); and the critical edition of *Suidæ Lexicon* (4 vols. 1834-53). His works on Roman and Greek literature, especially the history of the latter, are also of high value.

Berni (also *Bernia*), FRANCESCO, a favourite Italian poet, from whom comic or jocose poetry has the name of *Versi Berneschi*, was born at Lamporecchio, in Tuscany, about 1496. He first entered the service of his uncle, Cardinal Bibbiena, and was afterwards for several years secretary to Ghiberti, chancellor to Clement VII. About 1530 he betook himself to Florence, where he was made a canon, and lived in favour with the two Medici, Duke Alessandro and Cardinal Ippolito, till his death in 1536, which, however, according to another story, was brought about by the former, in consequence of Berni's refusal to poison the cardinal. His *Opere Burlesche* are to be found in the *Classici Italiani* (Milan, 1806). His recast or rifacimento of Boiardo's *Orlando Innamorato* was received with such favour that it was thrice reprinted from 1541-45; it is still read in Italy (and justly so) in preference to the original. He had a large share in establishing Italian as a literary language. A full account of Berni is given in his *Life* (Florence, 1882) by Virgili, who has also published a volume of his lyrics, letters, and Latin verses (1885).

Bernicia, a Latinised form of the British word *Bryneich*, used to indicate the northern part of what became the kingdom of Northumbria, the part north of the Tees. The Anglian kingdom of Bernicia is said to have been founded by Ida, who made his capital at Bamborough about 550 A.D. See NORTHUMBRIA.

Bernier, FRANÇOIS, a French physician and traveller, famous alike as a philosopher and a wit, was born at Angers, in France, and departed for the East about 1654. He visited Syria, Egypt, Arabia, and India, in the last of which countries he resided for twelve years in the capacity of physician to Aurungzebe, and on his return to France he published a delightful account of his travels in 1670-71. Bernier died at Paris in 1688.

Bernina, a mountain of the Rætian Alps, 13,290 feet high, in the Swiss canton of Grisons, with remarkable and extensive glaciers. Its summit was first attained in 1850. The Bernina Pass, which attains an elevation of 7642 feet, and over which run a carriage-road and a railway, leads from Pontresina to Poschiavo.

Bernini, GIOVANNI LORENZO, sculptor, architect, and painter, was born at Naples in 1598. He early devoted himself to sculpture, and in his

eighteenth year finished his admired group of Apollo and Daphne, which gave promise of greater excellence than was afterwards realised by the artist. Pope Urban VIII. employed him to produce designs for the embellishment of St Peter's at Rome, and his greatest achievement in architecture is its colossal colonnade. In 1663 he accepted the flattering invitation of Louis XIV., and travelled to Paris with great pomp. In Paris he resided above eight months; but his design for the Louvre being deemed inferior to Perrault's, he confined himself entirely to sculpture. His visit, however, proved a highly remunerative one. Richly laden with gifts, he returned to Rome, where he died, November 28, 1680, leaving a fortune of £100,000 to his children. Besides his works in sculpture, Bernini also left numerous paintings behind him. Few artists have been so much admired and rewarded during their lifetime as Bernini; but the triumphs of his art are now mostly regarded as absurdities.

Bernoulli, or BERNOULLI, was the name of a family that produced a succession of men who became famous over all Europe for the successful cultivation and extension of various branches of mathematical and physical science. The family originally resided in Antwerp, whence, in 1583, its attachment to the reformed religion drove it to seek an asylum in Frankfurt. Afterwards the Bernoullis settled in Basel, where they achieved the highest professional honours. Eight of them became highly distinguished; but special mention can be made here only of the three most celebrated—James, John, and Daniel.

JAMES BERNOULLI was born at Basel, December 27, 1654, where he also died, August 16, 1705. He devoted his life to the study of mathematics, of which, in 1687, he became professor in the university of Basel, succeeding in that chair the distinguished Megerlin. His *Conamen Novi Systematis Cometarum*, an essay on comets, suggested by the appearance of the comet of 1680, and his essay *De Gravitate Ætheris*, both showed the influence of Descartes' philosophy. Besides a variety of memoirs on scientific subjects, he published no other work of importance. *De Arte Conjectandi* was a posthumous work concerning the extension of the doctrine of probabilities to moral, political, and economical subjects. His collected works were published in 2 vols. 4to, at Geneva, in 1744. Among his triumphs are to be recorded his solution of Leibnitz's problem of the isochronous curve, and his determination of the catenary. At his request, a logarithmic spiral was engraved on his tomb, with the motto, *Eadem mutata resurgo*.

JOHN BERNOULLI, brother of the preceding, was born at Basel, July 27, 1667. He and James were the first two foreigners honoured by being elected associates of the Academy of Sciences at Paris, and they were also made members of the Academy of Berlin. John devoted himself to chemical as well as to mathematical science. In 1694 he took the degree of M.D., and soon after became professor of Mathematics at Groningen, whence he only removed to succeed his brother James in the university of Basel. His forte was pure mathematics, in which he had no superior in Europe in his day. He died January 1, 1748. The determination of the 'line of swiftest descent,' and the invention of the 'exponential calculus,' have been claimed as his achievements. His collected works were published at Geneva, in 4 vols. (1742).

DANIEL BERNOULLI, born at Groningen, February 9, 1700, died at Basel, March 17, 1782, was the second son of John. Like his father, he devoted himself to medicine as well as to mathematics. The family reputation early helped him to the professorship of Mathematics at St Petersburg,

whence he withdrew to Basel and occupied chairs of Anatomy and Botany and of Experimental and Speculative Philosophy. He wrote mainly on pneumatics and hydrodynamics.

Beroaldo, FILIPPO (1483–1505), born at Bologna, and a professor of classics at the university there, forwarded the cause of humanism by his lectures and his editions of Latin authors.

Berœ, one of the commonest representatives of the most intensely active sub-class of Cœlenterates—the Ctenophora (q.v.). These are free-swimming pelagic animals, of great delicacy and beauty, generally of a more or less cylindrical form, and without any trace of skeleton, which indeed rarely occurs in the more active lower animals. Berœ is the type of a small family, Beroidæ, in which the body is oval or spherical, but slightly flattened in one plane. They are transparent, and often beautifully coloured, especially during reproductive periods. The lower pole is occupied by the large mouth, which leads into a spacious and complex alimentary canal ending at the top. The superior pole bears a complex sensory organ, and between the two are eight meridian bands, each bearing a row of comb-like plates formed from the union of cilia. These ciliary plates move very rapidly, producing a beautiful iridescence, and wafting the berœ through the water in any desired direction. It has been shown that the limy 'otocyst,' which forms part of the sense organ, may act as an automatic balancing and steering apparatus. Like many other active marine animals, the Ctenophora are phosphorescent, and berœ is one of the most brilliant examples. The light shines out especially from the regions of the meridional bands. The berœs are very voracious, feeding on small crustaceans and the like, but with a marked preference for their own relatives. They are themselves swallowed in shoals by whales. During the day they descend to deeper water, but come to the surface at night. In autumn they seem to frequent the surface more constantly, and may then be observed in great crowds. The distribution of the genus, which includes three certain species, is very wide, and one form is quite common on British coasts. Berœ differs most markedly from related forms, such as Cydippe, Pleurobrachia, &c., in the absence of a pair of long tentacles. See CTENOPHORA.

Bero'sus, or BEROSSUS, a priest of Babylon, who had a knowledge of Greek, and flourished about 260 B.C. He wrote, in Greek, three books of Babylonian-Chaldean history, in which he made use of the archives in the temple of Bel at Babylon. The work was highly esteemed by Greek and Roman historians, but unfortunately only a few fragments have been preserved by Josephus, Eusebius, and Syncellus; even these are of great value, as they relate to the most obscure portions of Asiatic history. They have been edited by W. Richter (Leip. 1825), and Müller, in the second volume of *Historicorum Græcorum Fragmenta* of the 'Collection Didot' (Paris, 1848). The *Antiquitatum Libri Quinque cum Commentariis Joannis Anni*, first published in Latin by Eucharis Silber (Rome, 1498) as a work of Berosus, and often republished, was the pseudonymous work of the Dominican, Giovanni Nanni of Viterbo. See BABYLONIA.

Berre, ÉTANG DE, an extensive lagoon of France, département Bouches-du-Rhône, about 45 miles in circumference, with large salt-works and eel-fisheries.

Berri, or BERRY, formerly a province of Central France, now forming the départements of Indre and Cher. Having come, in 1100, into the possession of the French crown, it was raised to a duchy in 1360, and gave title at various times to French

princes, the younger son of Charles X. being the last who held it.

Berri, CHARLES FERDINAND, DUC DE, second son of the Count of Artois (afterwards Charles X.), was born at Versailles, January 24, 1778. In 1792 he fled with his father to Turin; fought with him under Condé against France; afterwards visited Russia, and lived for some time in London and Edinburgh. In 1814 he returned to France, and the following year was appointed by Louis XVIII. commander of the troops in and around Paris. In 1816 he married Caroline Ferdinande Louise (born 1798), eldest daughter of Francis, afterwards king of the Two Sicilies—a marriage on which depended the continuance of the elder Bourbon line. The duke was assassinated on 13th February 1820, as he was conducting his wife from the Opera-house to her carriage, by a fanatic named Louvel. He left only a daughter, born 1819; but on 29th September 1820, the widowed duchess gave birth to the Comte de Chambord (q.v.). After the July revolution, 1830, in which the duchess exhibited immense force of character and courage, offering herself to lead on the troops against the insurgents, she, with her son, followed Charles X. to Holyrood, but left a considerable party in France in favour of the pretensions of her son as Henry V. During a visit to Italy, she was so far encouraged in her ambition, that a project was formed for reinstating the Bourbons; and, accompanied by several friends, she landed near Marseilles, April 29, 1832. After many adventures, she was betrayed by a Jew at Nantes, and was imprisoned in the citadel of Blaye. The confession of the duchess, that she had formed a second marriage with the Neapolitan marquis, Lucchesi-Palli, at once destroyed her political importance, and the government set her at liberty. She died in Styria, 16th April 1870.

See works by Ménière (1882), Imbert de St Amand (1890; trans. 1893), and H. Noel Williams (1911).

Berry (*Bacca*), a term employed in popular language to designate almost any small succulent fruit, but restricted in botanical language to simple fruits with pericarp succulent throughout, whether developed from superior (grape, potato, bitternut, belladonna, bryony, asparagus, tomato), or more commonly inferior ovary (gooseberry, currant, hawberry, bilberry, &c.). Strawberry, raspberry, blackberry, mulberry, yewberry, &c. are thus all excluded from the definition, for the first is an expanded succulent axis, bearing the true fruits as dry nutlets; and the second and third are an aggregation or *aterio* of drupes (corresponding in fact, save for their origin from a single flower, to a bunch of cherries). The mulberry arises from the union of a crowded cluster of separate female flowers of which the fruit of each is an achene, the pulp belonging to the calyx, while the red berry-like pulp of the yew fruit is a subsequent upgrowth or *Aril* (q.v.).—The orange and other fruits of the same family, having a thick rind dotted with numerous oil-glands, and quite distinct from the pulp of the fruit, receives the name *hesperidium*; the fruit of the pomegranate, which is very peculiar in the manner of its division into cells, is also sometimes distinguished from berries of the ordinary structure by the name *balausta* (see POMEGRANATE). Fruits which, like that of the water-lily, are at first juicy, and afterwards, when ripe, are dry, are sometimes designated *berry-capsules*. Fruits of the gourd family (*Cucurbitaceæ*) are commonly distinguished under the name of *pepo*, but, at anyrate when the rind as well as the pulp is soft at maturity, are true berries.

Berryer, PIERRE ANTOINE, a distinguished French advocate and political orator, was born in Paris, 4th January 1790, and first distinguished

himself by his brilliant defence of Lammennais in 1826, and Chateaubriand in 1833. In 1829 he was chosen deputy, and ever afterwards steadily represented the rights and policy of the elder Bourbons. His legitimist tendencies kept him for a time in the political background under Louis-Philippe; but as the legitimist party in the Chamber increased, his position grew in importance. He repeatedly undertook the defence of persons prosecuted by the government, not only of his own party, but republican leaders. It was he who defended Louis Napoleon, 1840, after the Boulogne escapade, as well as Montalembert afterwards in 1858. With the elder Bourbons he was in constant communication, and was one of the heads of the legitimist party who made a pilgrimage to the Count of Chambord in London in 1843. After the revolution of 1848, he represented the Bouches-du-Rhône; seemed inclined to support the government of the president, Louis Napoleon; and became a member of his privy-council. But this did not hinder him from going to Wiesbaden in 1850 to do homage to the Count of Chambord. He was one of the few who boldly protested against the *coup d'état*. In 1854 he was elected a member of the French Academy. His inaugural speech contained some uncomplimentary allusions to the emperor, and its publication was for a time prohibited. He died at his country seat near Paris, 29th November 1868. His *Discours Parlementaires* fill 5 vols. (1872-74); his *Plaidoyers*, 4 vols. (1875-78). His statue was erected in the Palace of Justice at Paris in 1879.

Bersaglie'ri (Ital., 'marksmen'), the riflemen or sharpshooters of the Italian army, first organised in the Sardinian army in 1836. Light active soldiers, wearing a picturesque but serviceable dark-green uniform, and hats with dark plumes of cock's feathers, they were prominent alike in the Crimea and in the struggles that resulted in Italian unity. Akin to them are the Alpini, a force of mountaineer sharpshooters, organised since 1876.

Ber'serker, a redoubtable hero in Scandinavian mythology, the grandson of the eight-handed Starkadder and the beautiful Alfhilde. By the daughter of King Swafurilm, whom he had slain in battle, he had twelve sons, who inherited the name of Berserker, along with his frenzied, warlike fury or 'berserker-rage.' The name is also used as a general term for Scandinavian warriors of like temper. The etymology is doubtful. Probably the word means 'bear-sark' (or shirt), not 'bare-shirt.' It has been connected with the Werwolf (q.v.) superstition.

Bert, PAUL, French statesman and physiologist, was born at Auxerre in 1833. He studied both law and medicine, became assistant to Claude Bernard at the College of France, and successively occupied the chairs of Physiology at Bordeaux and Paris. Entering political life in 1870, on the proclamation of the Republic, he was four times re-elected to the Chamber. He brought forward laws removing primary instruction from the control of the religious orders, and making it compulsory. During the premiership of Gambetta he held the post of minister of public instruction and worship. While engaged in public life, M. Bert still pursued with ardour his scientific investigations, attracting world-wide attention by his experiments in vivisection. Appointed by the French Ministry to the governorship of Tonquin and Annam, he went out there in 1886, but died on 11th November of the same year. The anti-religious views of M. Bert excited much controversy. He was also the author of several works on anatomy and physiology, and of numerous educational and political writings. M.

Bert was a member of the French Academy of Sciences, and of many other distinguished bodies at home and abroad.

Bertha, the name of several famous women in the legendary history of the middle ages.—**ST BERTHA**, whose day is kept on the 4th July, a Frankish princess who married Æthelbert, king of Kent (560 A.D.), became the means of his conversion, and of the spread of Christianity among the Anglo-Saxons.—In the romances of the Charlemagne cycle, there figures a **BERTHA**, called also 'Bertrada with the Big Foot,' daughter of Count Charibert of Laon, wife of Pepin the Little, and mother of Charlemagne. Her whole personality is of a mythical nature, and has several of the attributes of the goddess Berchta.—In the romances of the *Round Table*, the name of a sister of Charlemagne, mother of Roland by Milo d'Anglesis.—Better known is **BERTHA**, wife of Rudolf II. (937), king of Burgundy beyond Jura, and afterwards of Hugo, king of Italy. See also **BERCHTA**.

Berthelot, **PIERRE EUGÈNE MARCELLIN**, an eminent French chemist, born at Paris, October 25, 1827, at an early age made a special study of acids and fermentation, and was appointed professor of Organic Chemistry in the *École de Pharmacie* in 1859, and in the *Collège de France* in 1861. In 1876 he was named inspector-general of education, in 1886-87 he was minister of public instruction, and in 1895 foreign minister. His labours to reproduce the substances which enter into the composition of organic bodies, besides opening up a new field of research, have directly benefited more than one industry. His early studies established the theory of polyatomic alcohols (see **ALCOHOL**), and he devoted much attention to explosives; whilst, more recently, his observations of the heat-phenomena which produce chemical combinations laid the foundation of thermochemistry. He died suddenly, 18th March 1907.

Among his works are *Chimie Organique* (1860), *La Poudre et les Matières Explosives* (1872), *La Synthèse Chimique* (3d ed. 1881), *Mécanique Chimique* (1879), *Les Origines de l'Alchimie* (1885), *Science et Philosophie* (1886), and *Science et Religion* (1897). And see the *Correspondance* between him and Renan (1898).

Berthier, **ALEXANDRE**, Prince of Neuchâtel and Wagram, was born at Versailles, February 20, 1753. A soldier's son, he entered the army in 1770, and fought with Lafayette in the American war of independence. In the French Revolution he soon rose to be chief of the staff in the army of Italy (1795), and in 1798 entered the papal territory, and proclaimed the republic in Rome. He accompanied Napoleon to Egypt in the same year as chief of the staff, a post which he also held in all the subsequent campaigns. At the revolution of 18th Brumaire (1799), he became war-minister, but continued to accompany the emperor on his campaigns. In 1807 he was made sovereign of the formerly Prussian principality of Neuchâtel, vice-constable, and imperial prince. In the campaigns of 1812, 1813, and 1814, he was constantly by the emperor's side, and acted both as chief of the staff and as quartermaster-general. On the fall of Napoleon, Berthier had to surrender the principality of Neuchâtel; and not to lose more, he submitted to Louis XVIII., who continued him his rank as peer and marshal. Napoleon made overtures to him from Elba; these he neither answered nor yet revealed to Louis, and this made him suspected by both. On the return of Napoleon from Elba, in a fit of irresolution Berthier retired to Bamberg, in Bavaria, to his father-in-law, Duke William. On 1st July 1815, as he looked from a window at a division of Russian troops marching towards the French frontier, the bitter sight was too much—he threw

himself down into the street, and thus ended his life. His *Mémoires* appeared in 1826.

Berthollet, **COUNT CLAUDE LOUIS**, one of the most distinguished theoretical chemists of his time, was born at Talloire, a village of Savoy, in 1748. He studied at Turin, and afterwards went to Paris. He now applied himself with great assiduity to chemistry; in 1781 he was elected a member of the Academy of Sciences. In 1785 he announced his adherence to the antiphlogistic doctrines of Lavoisier, whom he aided both in his researches on gunpowder and in the formation of a new chemical nomenclature. In the same year, Berthollet published a paper on 'dephlogisticated marine acid'—now called chlorine—pointing out its use for bleaching purposes; and following up the experiments of Priestley, he showed ammonia to be a compound of three volumes of hydrogen gas and one volume of nitrogen gas. During the early part of the French Revolution, he travelled through the country, giving instruction as to the process of smelting and converting iron into steel. He was made a senator by Bonaparte, who also made him a count. Notwithstanding, he voted for the deposition of Napoleon in 1814; and on the restoration of the Bourbons he was created a peer. He died at Arcueil, November 6, 1822.

Bertholletia. See **BRAZIL NUTS**.

Bertillon, **ALPHONSE** (1853-1914), criminologist, was born at Paris, and about 1885 worked out the 'Bertillon system,' now largely adopted in France and elsewhere, for identifying criminals by elaborate measurements of body, head, feet, and hands, which are carefully recorded for use upon occasion (see **ANTHROPOMETRY**, and his *Photographie Judiciaire*, 1890). In 1894 the system was introduced into Britain, being conjoined with Sir F. Galton's fingerprint method. He was the son of the anthropologist, Louis Adolphe Bertillon (1821-83).

Bertin, **LOUIS FRANÇOIS** (1766-1841), born in Paris, started the *Journal des Débats* in 1799. His royalist principles cost him imprisonment and banishment to Elba, but in 1805 he resumed the editorship of the *Débats*; and after the second restoration he gave almost constant support to the ministerial party, and to the July monarchy.—His son, **ARMAND LOUIS MARIE BERTIN** (1801-54), became secretary to Chateaubriand during his embassy in England, and succeeded his father on the *Journal des Débats*.

Bertram, **C. J.** See **RICHARD OF CIRENCESTER**.

Bertrand, **HENRI GRATIEN**, **COUNT**, one of Napoleon's generals, faithful to the last, was born at Châteauroux (1773), and early entered the armies of the Revolution as engineer. He accompanied the expedition to Egypt, and directed the fortification of Alexandria. He distinguished himself at Austerlitz, and became the emperor's adjutant; and, after the battle of Aspern in 1809, for his share in saving the French army by bridges, he was created count and governor of Illyria. After serving with credit in the subsequent campaigns, he retired with the emperor to Elba, was his confidant in carrying out his return to France, and finally shared his banishment to St Helena. On Napoleon's death, Bertrand returned to France, where, though sentence of death had been pronounced upon him—a sentence which Louis XVIII. had wisely recalled—he was restored to all his dignities, and in 1830 appointed commandant of the Polytechnic School. In 1840 he formed part of the expedition which brought back the remains of Napoleon to France. He died at Châteauroux, January 31, 1844.

Bervic, **CHARLES CLÉMENT**, engraver, born at Paris in 1756, in 1790 made himself famous by a full-length engraving of Louis XVI., from the

picture by Callet, one of the finest works of the kind ever produced. He died March 23, 1822.

Bervie, or **INVERBERVIE**, a parliamentary burgh and seaport in Kincardineshire, near the mouth of Bervie Water, 13 miles N.E. of Montrose by rail. It has flax and tow mills, and factories of wincey and sacking, and here in 1788 was set up the first machine for spinning yarn in Scotland. Pop. 1000.

Berwick, **JAMES FITZ-JAMES, DUKE OF**, was the natural son of James II., by Arabella Churchill, sister of the Duke of Marlborough. Born at Moulins in 1670, he was educated in France as a Catholic, and after serving in Hungary under Duke Charles of Lorraine (1687), returned to England shortly before the Revolution of 1688, which he exerted himself to prevent. The title Duke of Berwick was conferred on him in 1687. In 1689 he accompanied his father on his Irish expedition, and, after the death of St Ruth, had the nominal chief command. He next served in Flanders, under Marshal Luxembourg, and afterwards under the Duke of Burgundy and Marshal Villeroi. In 1706 he was created a marshal of France, and sent at the head of an army to Spain, where he established the throne of Philip V. by the decisive victory of Almansa. For this important service he was made a grandee of Spain, under the title of Duke of Liria and Xerica. After several years of comparative inactivity, he received the command in 1733 of an army intended to cross the Rhine. While besieging Philippsburg, he was killed by a cannon-ball, 12th June 1734. Contemporary testimony, confirmed by his military conduct, shows Berwick to have possessed some of the best qualities of a great commander. His defensive campaign in 1709, in Provence and Dauphiné, against the superior force of the Duke of Savoy, has always been regarded as a triumph of strategic skill. He was twice married. His son by the first marriage succeeded to the dukedom of Liria; whilst the dukedom of Fitz-James and the estates in France passed to his children by the second marriage. See his *Mémoires* (Paris, 1778); C. T. Wilson, *James II. and the Duke of Berwick* (1876); and his *Duke of Berwick, Marshal of France* (1883).

Berwick, NORTH. See **NORTH BERWICK.**

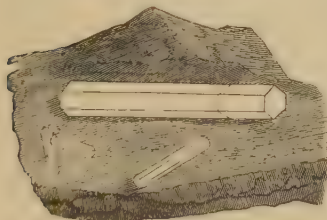
Berwick-on-Tweed, a seaport town at the mouth of the Tweed, on the frontiers of England and Scotland, 58 miles ESE. of Edinburgh, and 67 N. by W. of Newcastle. The liberties of the borough, called 'Berwick Bounds,' have an area of 8 sq. m., and with Spittal and Tweedmouth, form the 'county of the borough of Berwick-on-Tweed.' Though long boasting to be neither in England nor Scotland, and still possessing separate quarter-sessions and commission of the peace, it is to all intents and purposes part of the county of Northumberland (the adjoining parts of which formed till 1844 a detached portion of Durham); especially since by the Redistribution Act of 1885 Berwick-on-Tweed ceased to send two members of its own to parliament, and was for election purposes merged in Northumberland. The town is engirt with ramparts of Elizabeth's time, and fragments of Edward I.'s. Tweedmouth and Spittal (the latter a favourite watering-place), on the south side of the Tweed, have since 1835 both been included within the municipality of Berwick-on-Tweed. They are reached by a narrow stone bridge (1609-34) of fifteen arches; and the river is also spanned by Robert Stephenson's magnificent viaduct (1850) of 28 arches, 136 feet high and 2160 long. The public buildings include the town-hall (1760), with a belfry 150 feet high, the corn exchange (1858), and several churches, Presbyterian outnumbering the Anglican. The harbour has been improved by

the construction of a wet-dock (1873-76), at a cost of £40,000; but its trade is not very great, the tonnage of vessels entering during a twelvemonth ranging between 30,000 and 40,000. Nor is the salmon fishery what it once was. For the manufacture of agricultural implements Berwick-on-Tweed stands high, and in Spittal there are several large artificial-manure works. Pop. (1841) 12,689; (1881) 13,995; (1921) 12,994. The history of the town is full of interest, especially in regard to Border wars and the struggles of English and Scots to possess the town, the siege of Edward I. in 1296 being especially terrible. Its authentic records begin in the 12th century, when it was one of the principal seaports in the kingdom. It was annexed to England in 1333, after the battle of Halidon Hill, and was finally ceded by Scotland in 1482. See John Scott's *History of Berwick-on-Tweed* (Lond. 1888).

Berwickshire, a maritime and Border county of south-east Scotland, bounded N. by Haddington, N. and NE. by the German Ocean, SE. by Northumberland and Roxburghshire, and W. by Roxburghshire and Midlothian. It extends from east to west 29 miles, from north to south 21 miles, and has an area of 457 sq. m., or 292,535 acres. Berwickshire is divided naturally into three districts—the Merse, the Lammermoors, and Lauderdale. The largest and most fertile district is the luxuriant valley of the Merse, the richest plain of equal extent in Scotland, being nearly 130,000 acres in area. The Lammermoors, covering 90,000 acres, chiefly pastoral, divide the valley of the Tweed from Midlothian and Haddington. Lauderdale, comprising 67,000 acres, a mixture of hill and dale, runs along the banks of Leader Water. The coast, 19 miles in length, is rocky and bold, rising at St Abb's Head and other points to heights of from 177 to 528 feet above sea-level, and having only two bays, at Eyemouth and Coldingham. Geologically, as well as topographically, Berwickshire possesses numerous interesting features. The Lammermoors (q.v.), whose highest summit is Meikle Says Law (1749 feet), on the county boundary, and whose highest wholly in Berwickshire is Seenes Law (1683 feet), consist of Silurian strata, stretching to St Abb's Head. In the south Carboniferous rocks are found, while an extensive bed of Old Red Sandstone extends eastwards from the centre of the county to the sea-coast. On the coast porphyry is found, and some traps and syenite in the interior. Ironstone and thin seams of coal occur, as well as gypsum, clay, and shell-marl. The streams—Blackadder, Whitadder, and Leader Waters—are all tributaries of the Tweed, which runs along the southern boundary, the Eye alone flowing direct to the sea. Pop. (1801) 30,206; (1861) 36,613; (1891) 32,290; (1911) 29,643; (1921) 28,395. Berwickshire now unites with East Lothian to return one member to parliament. There are no parliamentary burghs in the county. Agriculturally, Berwickshire occupies a prominent position, two-thirds of the entire area being in cultivation. The Earlston ginghams excepted, there are no manufactures worth naming. The principal towns are Duns, the birthplace of Thomas Boston, Dr Mc'Crie, and, as some contend, of Duns Scotus; Greenlaw, the county town from 1696 till 1853, but gradually superseded by Duns; Lauder, a royal burgh; Eyemouth, a prosperous fishing-station; Coldstream, where General Monk first raised the Coldstream Guards; and Earlston, the Erclidoune of Thomas the Rhymer. The county contains some very interesting examples, though on a comparatively small scale, of Norman or Pointed architecture, or both, at Coldingham, Dryburgh, Old Cambus, Edrom, Chirside, Bunkle, Legerwood, and one or two other places. There are also the

remains or sites of Fast, Hume, and Cranshaws castles, and of British and Roman camps and barrows, besides remains of a curious brooch-like structure at Edinshall, near Duns.

Beryl (silicate of alumina and glucina), a mineral which scarcely differs except in colour from Emerald (q.v.), never exhibiting the bright rich green which characterises that gem, but colourless, yellowish, greenish-yellow or blue. The finer varieties, which are transparent and of beautiful colour, are distinguished as Precious Beryl, and are sometimes called Aquamarine.



Beryl, in its primary form.

These occur in crystals similar in form to those of emerald; but the regular hexagonal prism is more frequently modified by truncation on the angles or edges, acumination, &c. The prisms are often long. Their sides are longitudinally striated, often deeply so; but the truncating or terminating planes are smooth. The coarser varieties of beryl (Common Beryl) are also found crystallised, but often massive. Beryl occurs chiefly in veins that traverse granite or gneiss, or in drusy cavities in granite; sometimes it occurs in alluvial soils formed from such rocks. Common beryl is found in a number of places in Europe. The mountains of Aberdeenshire, and those of Mourne in Ireland, yield precious beryl, which is also found in various parts of the United States, Brazil, Ceylon, and Siberia. It is somewhat less valuable than the emerald. For its use as a magic crystal, in which the future becomes visible, see Rossetti's *Rose Mary*.

Beryllium. See GLUCINUM.

Berzelius, JOHAN JAKOB, BARON, one of the founders of the science of chemistry, was born at a farm in East Gothland, Sweden, August 29, 1779. While studying for the medical profession at the university of Uppsala, he was more attracted by the preparatory studies in science, especially chemistry. After being some time employed in medical practice and lecturing, he was appointed (1806) lecturer on chemistry in the Military Academy of Stockholm, and, in the following year, professor of Medicine and Pharmacy. He was shortly after chosen president of the Stockholm Academy of Sciences; and from 1818 till his death, August 7, 1848, held the office of perpetual secretary. The king raised him to the rank of baron; other honours from learned societies were conferred on him, including the London Royal Society's gold medal. The field of his activity lay in his laboratory, where he acquired a name of which his country, where he ranks in science second only to Linnæus, is justly proud. The science of chemistry, as at present organised, rests in great measure upon the discoveries and views of Berzelius, although in not a few points he has been controverted or found wrong. His multiplied and accurate analyses established the laws of combination on an incontrovertible basis; and to him we owe the system of chemical symbols. He discovered the elements selenium, thorium, and cerium, and first exhibited calcium, barium, strontium, columbium or tantalum, silicon, and zirconium, in elementary form. Of his numerous writings, the most important was a text-book of chemistry (3 vols. 1808-18), which was translated into every European language.

Besançon, a French city, the capital now of the department of Doubs, and formerly of Franche-Comté, is picturesquely situated on both sides of the winding river Doubs, 57 miles E. of Dijon. It was strongly but irregularly fortified by Vauban, the citadel being perched on an inaccessible rock, 390 feet above the town. Since then, the fortifications have been extended and strengthened, and Besançon is now considered one of the strongest places in France. It was the ancient *Vesontio* or *Besontium*; in 58 B.C. Cæsar expelled the Sequani hence, and in the neighbourhood gained a victory over Ariovistus. It finally came into the possession of France in 1674. Several streets in Besançon still bear old Roman names; and in the neighbourhood are found ruins of a triumphal arch of Aurelian, an aqueduct, an amphitheatre, and a large theatre. Among later structures the 12th-century cathedral, the Madeleine church, the Prefecture, the Palais de Justice (1749), and the half-Gothic, half-Renaissance palace (1534) of Cardinal Granvella, are most remarkable. Besançon makes a very large percentage of the watches made in France, and some 15,000 of its inhabitants are engaged in this industry, which was introduced from Switzerland about 1818. Other manufactures are porcelain, carpets, iron-wire, Seltzer-water, and beer. Abel Rémusat and Victor Hugo were natives. Pop. (1840) 36,461; (1886) 45,216; (1901) 55,266; (1911) 57,978; (1921) 55,652.

Besant, ANNIE, theosophist, was born in London of Irish parentage (her father William Page Wood) in 1847, and at twenty, a devout Anglican, married the Rev. Frank Besant of Sibsey, Lincolnshire. Having become a freethinker, and been legally separated from her husband in 1873, she joined the National Secular Society and was closely associated with Mr Bradlaugh (q.v.), the Fabian Society, and the Social Democratic Federation. In 1889, however, she became a devoted disciple of Mme. Blavatsky (q.v.); thenceforward at home and abroad, in the United States and in India, she laboured zealously in the cause of theosophy, publishing over a score of works, including an autobiography (1893), *Karma Dharma, The Wisdom of the Upanishads*, and *Esoteric Christianity* (1901). At Benares she founded the Central Hindu College, and a Hindu girls' school, on pure Hindu principles, and helped to found the Hindu University; but the Theosophic headquarters are at Adyar, Madras. Interned in 1917 for nationalist activities, she was in the same year chairman of the Indian National Congress. The article THEOSOPHY in this work is from her pen.

Besant, SIR WALTER, novelist, was born at Portsmouth in 1836, studied at King's College, London, and at Christ's College, Cambridge, and in 1861-67 was professor in the Royal College of Mauritius. He was knighted in 1895. His first work, *Studies in Early French Poetry*, appeared in 1868, and, in literary partnership with James Rice (q.v.), he produced *Ready-money Mortiboy* (1872); *My Little Girl*; *With Harp and Crown*; *This Son of Vulcan*; *The Golden Butterfly* (1876), which greatly increased the popularity of its authors; *The Monks of Thelema*; *By Celia's Arbour*; *The Chaplain of the Fleet*; and *The Seamy Side* (1881). After Rice's death, Besant wrote *All Sorts and Conditions of Men*, *The Captain's Room*, *All in a Garden Fair*, *Dorothy Foster*, *Children of Gibeon*, *The World went very well then*, *Beyond the Dreams of Avarice*, *The Master Craftsman* (1896), &c. He wrote also *French Humourists* (1873); short books on Rabelais, Coligny, and Whittington; a life of Professor Palmer (1883); a long series of works on London (1892-1912); and a number of articles for *Chambers's Encyclopædia*. He shows a first-

hand knowledge of very various phases of life, grasp of character, constructive skill, and humour at once shrewd and genial. The distinguishing feature of his novels is the interplay of ingenious fancy and thorough-going, healthy realism. His plots are sometimes as whimsical and charming as a fairy tale, while the setting of each story is worked out with scrupulous fidelity to local colour. In such a book as *All Sorts and Conditions of Men*, romance and realism are combined with the happiest results. Some of his later novels were written for the furtherance of social reforms, and the People's Palace, described in *All Sorts and Conditions of Men*, was carried into effect in the east end of London. His works on London and its history are partly by others. He was secretary of the Palestine Exploration Fund (1868-85), and first chairman of the committee of the Incorporated Society of Authors. He died 9th June 1901. See the library edition of *Ready-money Mortiboy* (1887), and his *Autobiography* (1902).

Besants'. See BEZANTS.

Besika Bay, a bay on the north-west coast of Asia Minor, opposite Tenedos, to the south of the entrance of the Dardanelles. The English fleet was stationed here during crises in the Eastern Question, in 1853-54 and 1877-78, and it was shelled in March 1915.

Bessarabia, a region of north-eastern Rumania, on the Ukrainian frontier. The area is 17,000 sq. m.; the population is about 2,400,000, composed of Rumanians, Russians, Poles, Bulgarians, Greeks, Armenians, Jews, Germans, and Tatars, with a sprinkling of Gipsies. The Dniester flows along the whole of its northern and eastern boundaries; the Pruth separates it from Moldavia on the west; and it has the Danube on the south. In the north-west the country is traversed by well-wooded offshoots of the Carpathian Mountains. Generally, however, Bessarabia is flat and fertile. The land is cultivated to some extent; but the breeding of cattle forms the chief business of the inhabitants. Salt, cattle, wool, and tallow are exported; leather, soap, and candles are manufactured. Bessarabia, which fell under the power of the Turks in 1503, suffered heavily in all wars with Russia, and was ceded to Russia in 1812. The portions lying along the Pruth and the Danube—3578 sq. m.—were by the Treaty of Paris assigned to Moldavia, but at the Berlin Congress of 1878 again transferred to Russia. In April 1918 the Bessarabian diet decided for union with Rumania.

Bessarion, JOHANNES (or *Basilius*), born at Trebizond, on the Black Sea, in 1395, was one of the earliest of those scholars who in the 15th century transplanted Greek literature and philosophy into the West, and rescued the mind of Christendom from the trammels of scholasticism. As Bishop of Nicæa, he accompanied the Greek emperor, John Palæologus, to Italy in 1439 in order to effect a union between the Greek and the Roman churches. Soon afterwards joining the Roman Church, he was made cardinal by Pope Eugene IV. Ten years later, Nicholas V. created him Bishop of Frascati. For five years also he discharged the duties of papal legate at Bologna. After the fall of Constantinople, of which he had been titular patriarch, he visited Germany, and endeavoured to promote a crusade against the Turks. In philosophy, he professed to be a follower of Plato, but without depreciation of Aristotle. Twice he was nearly elected pope. He died at Ravenna in 1472, leaving 600 valuable Greek MSS. to St Mark's Library at Venice.

Bessbrook, a town of County Armagh, 2 miles NW. of Newry; pop. 3400.

Bessèges, a town in the French department of Gard, 21 miles N. of Alais. It has coal, iron, and glass industries. Pop. 7000.

Bessel, FRIEDRICH WILHELM, an eminent Prussian astronomer, born at Minden in 1784. Successively a merchant's clerk, a supercargo on board ship, and a practical astronomer, he was in 1810 appointed director of the observatory at Königsberg, and professor of Astronomy there. In 1818 he published his *Fundamenta Astronomiæ*—a work which was of the highest value to astronomers; and in 1830 his *Tabulæ Regiomontanæ*. Among the numerous papers may be mentioned his treatise on the precession of the equinoxes. After a series of three years' observations he succeeded in determining the annual parallax of the fixed star 61 Cygni (see STARS). In the years 1824-33 Bessel made a series of 75,011 observations in 536 sittings, and completed a catalogue of stars (extending to the ninth magnitude) within the zone from 15° N. to 15° S. declination; and published *Astronomische Untersuchungen* (1842) and other works. His *Popular Lectures on Astronomy* were published two years after his death, which took place March 14, 1846. He was a thoroughly practical man of science, was remarkable for the precision of his calculations, introduced many new methods, and greatly forwarded the science of astronomy.

Bessemer, SIR HENRY, F.R.S., inventor, born 19th January 1813, at Charlton, Herts, came of Huguenot stock. His father, Anthony Bessemer, born in London, was bred an engineer, and helped in the erection of the first steam pumping-engine set to work in Holland. Later he became eminent as a die-sinker and engraver in the Parisian mint, but was ruined by the Revolution, and retired to Charlton in Herts. His son Henry was trained by him at a small type-founding factory in Charlton, and in London worked at electrotyping, embossing, and die-sinking. He soon became a prolific inventor, and by a perforated die saved government £100,000 a year in frauds in respect of stamps. But this, like many of his inventions, was but poorly recompensed. His first pecuniary success was obtained by his invention of machinery for the manufacture of Bessemer gold and bronze powders, which was not patented, but whose nature was long kept secret. During the Crimean war he experimented in improving artillery, and to enable cannon to sustain the strain of discharging a projectile he had invented, experimented with a view to producing iron of greater strength. He came to think, in his own words, that 'if air could be brought into contact with a sufficiently extensive surface of molten crude iron the latter would rapidly be converted into malleable iron.' Patents were taken out in 1855, his 'converter' and apparatus were at work in London, and soon after he established a Bessemer steel works at Sheffield. The process is fully described in IRON AND STEEL, as also the importance of the development due to Mushet. The result was that, spite of great initial difficulties, the production of steel in England increased from less than 50,000 tons by the old processes in 1858 to over 2,000,000 in 1889. While the older (and finer) steel cost on an average not less than £50 a ton, Bessemer steel soon averaged £10. Great quantities of Bessemer steel are made in Germany and the United States. Bessemer was knighted in 1879, and in addition he had, to use his own words, received in the form of royalties 1,057,748 of the beautiful little gold medals issued by her Majesty's Mint. One of his unsuccessful inventions was a Channel boat with a saloon swinging freely so that it might, even in a heavy sea, be kept level and steady, and so save from the

pangs of sea-sickness. Such a boat was put on the cross-Channel service in 1875, but the mechanism was not found serviceable. Bessemer died 15th March 1898. See his Autobiography (1905).

Bessemer's name has been given to several towns in the United States. The most important is Bessemer in Jefferson County, Alabama, 11 miles SW. of Birmingham, in a country rich in iron and coal. The city, laid out in 1887 and incorporated in 1889, had in 1890 a population of 4544, in 1900 of 6358, in 1910 of 10,864, and in 1920 of 18,674. Iron and steel are largely produced, as also firebrick.—Another Bessemer is the county-seat of Gogebic, Michigan, 47 miles E. of Ashland in Wisconsin, and is engaged in iron-mining and manufacturing; pop. 5500.

Bessières, JEAN BAPTISTE, Duke of Istria, and Marshal of the French empire, was born of poor parents at Preissac, in the department of Lot, 6th August 1768. Entering the army in 1792 as a private soldier, in less than two years he had attained the rank of captain. After making the Spanish campaign he passed into the army of Italy, and soon attracted the notice of Napoleon, who carried him to Egypt in 1798, where his conduct at St Jean d'Acre and Aboukir covered him with glory. At the accession of Napoleon (1804) to the throne, he became marshal of France. He showed his usual conspicuous courage at Austerlitz, Jena, Eylau, and Friedland, and, raised to the rank of Duke of Istria, commanded in Spain in 1808-9. In the Russian campaign he led the cavalry of the Guard, and did much by his sleepless courage and presence of mind to save the wreck of the army in the disastrous retreat from Moscow. On the morning of the battle of Lützen (1st May 1813), he fell mortally wounded by a cannon-ball.

Best, WILLIAM THOMAS (1826-97), was born at Carlisle, the son of a solicitor, and was trained as an organist at the cathedral there. He held appointments at Liverpool in 1848-52, at London in 1852-54, and in 1855 returned to Liverpool to be organist of St George's Hall. He was also solo organist at the Handel Festivals. He composed many anthems, fugues, sonatas, and arrangements for the organ, and published two works on the organ and organ-playing.

Bestiary, the name given to a class of written books of great popularity in the middle ages, describing many animals, real and fabled, composed partly in prose, partly in verse, and generally illustrated by drawings. But they were valued for the moral allegories they contained, no less than as handbooks of zoological facts. The symbolism which was then so much in vogue fastened spiritual meanings upon the several animals, until every quality of good or evil in the soul of man had its type in the beast world. It is in this way to the bestiaries that we must look for explanation of the strange, grotesque creatures which are found sculptured on the churches and other buildings of the middle ages. The oldest Latin bestiaries had an early Greek original, the well-known *Physiologus*, under which name about fifty such allegories were grouped. The Greek text of this famous work is found only in late MSS. There are old Syriac, Armenian, Ethiopic, Arabic, Icelandic, and numerous Latin versions. Editions of the Latin have been issued—Mai, Heider, and Cahier. An Old High German version was made earlier than the 11th century; in the 12th century versions in French were made by Philippe de Thaun, Guillaume, a priest of Normandy, and Pierre, a priest of Picardy. Some Old English fragments have been edited by Grein and by Cook. The 13th century Bestiary in the South-east Midland dialect describes thirteen animals. One

section is founded on Neckam's *De Naturis Rerum*, the rest on the Latin *Physiologus* of Theobaldus, an Italian monk of the 11th century. The *Bestiaire d'Amour* of Richard de Fournival was rather a parody upon the earlier form of such books. The following is a characteristic extract from the *Bestiaire Divin*: 'The unicorn has but one horn in the middle of its forehead. It is the only animal that ventures to attack the elephant; and so sharp is the nail of its foot, that with one blow it rips up the belly of that most terrible of all beasts. The hunters can catch the unicorn only by placing a young virgin in the forest which it haunts. No sooner does this marvellous animal descry the damsel, than it runs towards her, lies down at her feet, and so suffers itself to be taken by the hunters. The unicorn represents our Lord Jesus Christ, who, taking our humanity upon him in the Virgin's womb, was betrayed by the wicked Jews, and delivered into the hands of Pilate. Its one horn signifies the gospel truth, that Christ is one with the Father,' &c. See *The Old English Physiologus* (text and prose translation by A. S. Cook, verse translation by I. H. Pitman, 1922).

Bestushev, ALEXANDER, a Russian novelist, born in 1795, was an officer in the guards, and became involved in the military conspiracy of 1825, in consequence of which he was degraded to the ranks, and exiled to Yakutsk. After long entreaty he was permitted to enter the army of the Caucasus as a private in 1830. In June 1837 he fell in a skirmish with the as yet unconquered mountaineers. His novels and sketches bore the impress of his own life and adventures in the Caucasus.

Bestushev-Ryumin, COUNT ALEXEI PETROVICH (1693-1768), was born at Moscow, but trained in Berlin, and by permission of Peter the Great entered the diplomatic service of the Elector of Hanover in 1713. He accompanied George I. to England in 1714, and remained there for some years. He served Peter faithfully as Russian minister at Copenhagen from 1822, became privy councillor to the Empress Anna, and under Elizabeth became vice-chancellor of Russia, practically controlling Russian policy for many years, hostility to Frederick the Great and alliance with Austria being his main principles of action. His recall of Apraxin caused him to be imprisoned on a charge of treason and condemned to death. Elizabeth remitted the death penalty, but he was deprived of all his dignities and exiled from court. The Empress Catharine II. recalled him, made him field-marshal, and relied on his advice for years.—His elder brother, COUNT MIKHAIL PETROVICH (1688-1760), was Russian ambassador at Stockholm, and for twenty years controlled the delicate relations between Russia and Sweden. After 1741 he, now a marshal, undertook embassies to Prussia, Poland, Austria, and France.

Bestushev-Ryumin, KONSTANTIN NIKOLAEVICH (1829-97), born in Novgorod province, studied law at Moscow, worked as a journalist in 1859-62, and from 1862 was professor of Russian history at Petersburg university. He translated Buckle into Russian, wrote much on history, and was author of a great *History of Russia* (vols. i. and ii. 1872-85; vol. iii. unfinished).

Betanzos (anciently *Brigantium Flavium*), a town of Spain, 10 miles SE. of Coruña; pop. 10,000.

Betel, properly the leaf of the betel-vine, a plant (*Piper betle*, or *Chavica betle*) of the natural order Piperaceæ, indigenous to the East Indian Archipelago, and cultivated also in continental India, Ceylon, and several of the Indo-Chinese countries (Burma, Siam, &c.), but more

or less as an exotic according as the necessary conditions of humidity and heat have to be artificially increased. The name betel (a Malayalam and Tamil word for 'leaf') is frequently applied to the bolus of areca-nut and shell-lime (*chunam*) wrapped round with betel-leaf, employed as a masticatory throughout a large part of the farther East, especially by the Malay and Hindu races. As early as Fryer (1673) betel begins to be used erroneously as a synonym for the nut of the Areca (q.v.) palm. Betel-leaf (Hindustani, *pān* or *pawn*; Persian, *tambul*; Malay, *sirih*) is described in glowing terms in the *Hitopadesa*, book iii., fable 9. The ancient Hindu writers recommend it to be taken early in the morning after meals, and at bedtime. Pills against phlegm are rubbed into an emulsion with the juice; and the leaves are applied to remove headache, reduce swollen glands, or check the secretion of milk. The use of the masticatory has become a matter of etiquette, and the betel-box plays as important a part as the snuff-box did in England in the 18th century. In India the offering of *pawn* by the host intimates the termination of a visit. Among the Malays of the Archipelago to offer *sirih* is accepted as a legal sign of apology for a serious offence. Europeans seldom take kindly to the habit of chewing betel,



Betel-vine.

partly because it blackens the teeth and causes the lips to appear as if covered with blood. Sir James Emerson Tennent (*Ceylon*) considers that it supplies the antacid, the tonic, and the carminative required by a people who usually eat no flesh. In former days the betel-leaf was a monopoly of the East India Company. The cultivation of the plant is in many districts a highly important industry, and requires considerable capital. In Bombay, betel-vines are put down in October, 3600 to 5000 per acre. They are sheltered from drought by plantains grown along with them, and by bamboo stages covered with grass. These are afterwards replaced by stronger and taller trellis-work up which the plants climb luxuriantly. In Tenasserim, again, the Karens train the vines to forest-trees from which all but the topmost boughs have been lopped off.

Betel-nut. See ARECA.

Betham-Edwards. See EDWARDS.

Beth'any ('house of dates'), by the natives of Palestine called 'El' Azariyeh' or 'Lazariyeh'

(‘town of Lazarus’), is situated on the southern slope of the Mount of Olives, 2208 feet above the sea, 2 miles ESE. of Jerusalem. It was the home of Lazarus and his sisters, often visited by the Saviour, and the scene of his ascension. Ecclesiastical buildings were erected here in the 4th century, but it is now a poor place of some 200 inhabitants. There is nothing remarkable about the village except the reputed house of Martha and Mary, and the cave or grave of Lazarus shown by the monks. Major Conder thinks it more likely that the tomb of Lazarus is one of the rock-cut sepulchres beside the Jericho road, east of Bethany.—Bethany is also the name that has been given to three German mission stations in South Africa; one in Great Namaqualand, one in the Orange Free State, and one in the Transvaal.

Beth'el ('house of God'), now called Beitin, about 11 miles N. from Jerusalem, mentioned in Scripture as the scene of Jacob's dream. The old name of the place was Luz. Here Abraham pitched his tent; at a later date it was a resting-place of the ark, a royal residence, and a seat of idolatrous worship. It is a heap of ruins.

Bethesda, POOL OF ('house of mercy' or 'house of the stream'), the scene of Christ's cure of the impotent man (St John, v. 2-9), the tank that was the resort of the 'impotent, blind, halt, and withered.' Since 1102 it has been identified with the Birket Israil, which is situated within the walls of Jerusalem, near the St Stephen's gate and the Temple of Omar. Conder, however, identified it with the spring in the Kedron Valley called Gihon and En Rogel, which was diverted through a rock-cut tunnel to Siloam. But Schick in 1889 discovered the remains of the substructures of the pool near the church of St Anne.

Bethesda is a small town of Carnarvonshire (so named from its Nonconformist chapel), $\frac{1}{2}$ miles SE. of Bangor. Its 4000 inhabitants are mostly employed in the neighbouring Penrhyn slate-quarries.

Bethlehem ('house of bread'; modern *Beit-lahm*), the birthplace of Jesus Christ and of King David, and the Ephrathah of the history of Jacob, is now a small unwall'd village of white stone houses, in the midst of a most interesting country, 6 miles S. of Jerusalem. The population, about 3000 souls, is wholly Christian—Latin, Greek, and Armenian. The Convent of the Nativity, a large square building, resembling a fortress, was built by the Empress Helena, 327 A.D., but destroyed by the Moslems in 1236, and, it is supposed, restored by the Crusaders. Within it is the Church of the Nativity, which is subdivided among the Latins, Greeks, and Armenians, for devotional purposes. The church is built in the form of a cross; the nave, which is by far the finest part of the building, belongs to the Armenians, and is supported by 48 beautiful Corinthian columns of solid granite, each between 2 and 3 feet in thickness, and about 17 in height. The other portions of the church, forming the arms of the cross, are walled up. At the farther end of that section, which forms the head of the cross, and on the threshold, is a sculptured marble star, which the Bethlehemites say covers the central point of the earth. Here a long intricate passage descends to the crypt below, where the blessed Virgin is said to have been delivered. The walls of the chamber are hung with draperies of the gayest colours; and a silver star, with the words, '*Hic de virgine Maria Jesus Christus natus est*,' marks the spot of the nativity. The manger stands in a low recess cut in the rock. The site appears to have been venerated since the

2d century A.D., and St Jerome, a monk of this convent towards the end of the 4th century, found the grotto in possession of pagans, who celebrated here the birth of Adonis. To the north-west stands



Bethlehem.
(From a Photograph by Frith.)

a square domed building, marking the reputed site of Rachel's tomb. The Bethlehemites chiefly gain their subsistence by the manufacture and sale of crucifixes, beads, boxes, shells, &c. of mother-of-pearl and olive wood.

Bethlehem, a city of Pennsylvania, on the Lehigh River, 45 miles N. of Philadelphia, is the principal settlement in America of the Moravians, by whom it was founded in 1741. It has silk, paint, and flour mills, and is noted for its excellent schools. Two bridges across the Lehigh connect the former borough of Bethlehem with South Bethlehem, seat of Lehigh University (1866) and other institutions, with iron and steel works. West Bethlehem, across Monocacy Creek, has silk and planing mills, machine-shops, and dye-works. The three boroughs are now united. Pop. 50,000.

Bethlehem, a town of the Orange Free State, 57 miles W. of Harrismith, in an agricultural and coal-mining district; pop. 6000.

Bethlehemites, (1) a monastic order existing in England in the 13th century, who had a monastery at Cambridge, founded in 1257.—(2) A military order established by a bull of Pius II. in 1459, to provide a bulwark against the attacks of the Turks.—(3) A society founded in Guatemala about 1659, and raised to an order by Innocent XI. in 1687.—The followers of John Huss were styled Bethlehemites, from Bethlehem Church in Prague, where their leader preached.

Bethlem. See BEDLAM.

Bethlen-Gabor (i.e. GABRIEL BETHLEN), descended from an ancient and distinguished Protestant family of Hungary, was born in 1580. He rose to prominence during civil troubles in Transylvania, and on the death of Gabriel Bathori succeeded (1613), by the aid of the sultan, in being chosen sovereign prince of Transylvania. In 1619, when the Bohemians rose in defence of their religious and political rights, they looked eagerly for support to Gabor, who was glad of such an opportunity to gratify his ambition at the expense of his enemy, Austria. He accordingly marched into Hungary, took Kaschau, his advance more resembling a triumphal procession

than a hostile invasion, and on arriving under the walls of Presburg, was greeted with acclamations by the citizens. He was subsequently crowned king of Hungary by the assembled diet, August 25,

1620. After various alternations of fortune, in which he was ultimately successful, a peace was in 1621 concluded with Ferdinand II. of Austria, by which Gabor gave up his claims to Hungary and the title of king, but obtained large accessions of territory, and the dignity of prince of the empire. This treaty, however, was soon broken by the emperor; but the prince raised an army of 60,000 men, invaded Moravia, and obtained the solemn renewal of the former treaty. He died in 1629. His reign was a glorious epoch in the history of the principality; for not only did his military successes give a prestige to its arms, but his protection of science and letters did much to aid the progress of learning.

Bethmann-Hollweg, THEOBALD VON (1856–1921), born at Hohenfinow, near Eberswalde, studied law at Strassburg, Leipzig, and Berlin, entered the civil service, and sat in the Reichstag. He became oberpräsident of Brandenburg (1896), Prussian minister of the Interior (1905), and Imperial Chancellor (1909). The Great War placed him in an invidious situation which he lacked strength to cope with. He was dismissed in 1917. See his *Betrachtungen zum Weltkrieg* (1919).

Bethnal Green, a north-eastern metropolitan borough, once largely peopled by Huguenot silk-weavers, now a centre of the boot and shoe manufacture, and of tailoring. Its museum is a branch of the Victoria and Albert. Pop. 117,000.

Bethsaida, a village on the western shore of the Lake of Galilee, the birthplace of Peter and Andrew and Philip.—At the north-eastern extremity of the lake was another Bethsaida, scene of the feeding of the five thousand. Philip the Tetrarch renamed it Julias.

Bethulia, scene of the exploits of Judith (q.v.), seems to have been in the north of Galilee, but otherwise unknown has been variously identified with Safed and other places.—BETHULIE, named from it, is a town in the Orange Free State, 3 miles from the Orange River; pop. 2500.

Béthune, a town in the French department of Pas-de-Calais, 16 miles NNW. of Arras, with a trade in soap and beet-sugar, suffered heavily in 1918; pop. 17,000. The town was Flemish till 1713. Sully (q.v.) belonged to the family founded there in 970. The Scottish family of Bethune or Beaton (q.v.) is said to have come thence to England with William the Conqueror.

Bet'ony. See STACHYS.

Betterment, an improvement to real property made by a tenant such as justifies him in claiming compensation from the landlord. A betterment tax is one assessed on property benefited by a public improvement. See INCREMENT (UNEARNED).

Betterton, THOMAS, actor, was born in London about 1635, and, after serving as a bookseller's apprentice, turned actor some three years before the Restoration, and in 1661 joined Davenant's theatrical company. The best contemporary judges,

such as Addison, Cibber, Dryden, &c., bear admiring witness to his dramatic powers, which overcame the natural disadvantages of a low voice, small eyes, and an ungainly figure. Pepys thought him the best actor in the world. His private character was highly estimable, cheerful, modest, and generous. In an unfortunate speculation in 1692 Betterton lost all his savings. A public benefit was got up for him on the 6th April 1709, and he acted several times again before his death on 28th April 1710. He was buried in Westminster Abbey. Mrs Betterton, whom he had married in 1662, took the same rank among contemporary actresses as her husband did among actors. Betterton's own eight dramas were adaptations. See Doran, *Their Majesties' Servants* (2d ed. by R. W. Lowe, 1887); and the *Life* by R. W. Lowe (1891).

Bettia, a municipal town in the north-west corner of Bihar, India, on the line of the Tirhut state railway, is headquarters of the Bettiah Raj. Pop. 26,000, about two-thirds Hindus. There has been a Roman Catholic mission here since 1746.

Betting is a mode of gratifying the passion for gambling. It takes a great variety of forms, and, in one form or another, has been pursued in all ages and among all peoples. So powerful are its fascinations for many persons that the exhortations of moral and religious teachers, and the discouragements and the restraints of law, have proved ineffectual to suppress, or even seriously to curb, the practice. Betting or wagering may take place in connection with any uncertain event; and persons addicted to betting are ready to make a bet upon anything. But the practice has come to be specially associated with horse-races and other branches of sport. The habit of betting upon sporting events is, it would seem, now more widespread than in any previous generation. Race-courses and race-meetings have multiplied; sporting intelligence, containing selections of probable winners, betting quotations, and miscellaneous racing chatter, is widely published in newspapers and by other agencies; and the Turf has its adherents in all classes of society. The great development of other branches of sport in recent years has also been accompanied by a corresponding increase of betting in connection therewith.

A betting or wagering contract is one in which the parties mutually agree that, dependent upon the determination of an uncertain event, one shall win from the other, and that other shall pay or hand over to him a sum of money or other stake. There must be something at hazard between the parties, which each of them may either win or lose. Further, it is essential that the real motive of the parties in entering into the contract should be the winning or losing of the stake. If a party has a genuine commercial interest in the issue of the event, antecedent to the contract and independent of the transfer of the stake, this interest furnishes a motive and consideration for the making of the contract other than the winning or losing of the stake, and accordingly the contract is regarded in law as being outwith the category of betting contracts. Thus the distinction between a contract of insurance and a wagering contract lies not in the nature of the contracts, but solely in the presence of what is called an 'insurable interest,' and in the absence of such an interest a policy of insurance is, in law, nothing but a wager. Similarly in many other forms of speculative agreements, in which the gain or loss to either party is dependent on an uncertain event, the presence or absence of antecedent and independent interest in the event on the part of one or both of the parties is taken in law as a working test in determining whether the

agreement was directed to serve a proper commercial purpose or was merely a gambling transaction.

'Gaming' contracts, in which the parties play a game for stakes hazarded by the players, or bet upon the sides or hands of those who play a game, constitute a special class of betting contracts, and are treated in a separate article (see GAMING). Here we are primarily concerned with betting or wagering in the wide sense of the term described in the previous paragraph.

At English common law bets were lawful, and could be enforced by action like any other contract, except when they were calculated to disturb the peace or were contrary to public policy. A bet, for example, upon the conviction or acquittal of a prisoner was held to be unenforceable, as tending to disturb the course of justice. The distinction which English law now makes between betting contracts and other contracts is entirely the creation of statutes, and is based on reasons of public policy. The earlier gaming statutes were concerned exclusively with playing games for stakes or betting on the players (see GAMING). It was not till 1845 that the legislature struck at betting contracts in general, whether relating to games or to other events. The act of 1845 (8 and 9 Vict. chap. 109), which continues to be the governing statute, and extends to bets and wagers of every kind, enacts (sect. 18) that 'all contracts or agreements, whether by parole or in writing, by way of gaming or wagering, shall be null and void; and no suit shall be brought or maintained in any court of law or equity for recovering any sum of money or valuable thing alleged to be won upon any wager, or which shall have been deposited in the hands of any person to abide the event on which any wager shall have been made.' The act, while it makes bets void, does not render them illegal. A person may lawfully make a bet; but the courts do not enforce the contract. It is in the option of the loser whether or not he pay; if he pay after the event, the money cannot be recovered. The act of 1845 did not affect the validity of transactions collateral to, or of implied contracts arising out of, wagers. Thus, if a person employed a commission agent to make bets for him, the agent, if he paid the losses, could sue his employer for the money so paid; and, conversely, if he received payment of winnings, he could be sued by his employer for the amount of these winnings. This state of the law, which was deemed to encourage unduly the employment of commission agents or 'turf-accountants,' was altered by the Gaming Act of 1892 (55 Vict. chap. 8), which renders null and unenforceable any promise, express or implied, to pay any person any sum of money paid by him in respect of any contract rendered void by the Gaming Act, 1845, or to pay any sum of money by way of commission fee or reward in respect of any such contract, or of any services in relation thereto or in connection therewith. Under this act, it will be observed, the position of a commission agent is peculiarly unfavourable; for, while he cannot sue for any fee or commission or for any sum paid by him on his employer's behalf in respect of bets lost, he remains accountable to his employer for all sums received by him on his employer's behalf in respect of bets won.

Money knowingly lent for the purpose of betting on games, or lent at the time and place of play to a player, cannot, in virtue of certain statutes, be recovered (see GAMING); but there is no enactment striking at the recovery of money which has been lent either for the purpose of betting on events other than games or for the purpose of enabling the borrower to pay bets which he had previously lost, whether, in the latter case, the bets were on games or on other contingencies (*Ex parte Lancaster* [1911], 2 K.B. 981).

All bills, notes, cheques, and other securities given in payment of money lost on bets of any kind are unenforceable between the original parties. Under section 2 of the Gaming Act, 1835, money paid to the indorsee, holder, or assignee of securities given for consideration arising out of certain gaming transactions was recoverable from the person to whom the securities were originally given. In *Sutters v. Briggs*, 1922 A.C. 1, it was held that, in virtue of this enactment, the loser of a bet on a horse-race, who had drawn a cheque for the amount of the bet in favour of the winner, was entitled to recover from the winner the amount of the cheque, which had been indorsed by the winner and handed by him to his bankers for collection and had been duly cleared and paid. Following on this decision the Gaming Act, 1922, which came into operation on 20th July 1922, was passed, repealing section 2 of the Gaming Act, 1835, and expressly providing that no action for the recovery of money under that section shall be entertained in any court.

Where money or other valuable thing is deposited with a stake-holder to abide the result of a bet, the winner of the bet is prevented by the terms of section 18 of the act of 1845 (quoted *supra*) from bringing an action against the stake-holder for its recovery. The party, however, who has made any such deposit with a stake-holder has a right to demand back and recover from the stake-holder what he has deposited, even after the event upon which the bet was made has been determined, at any time before the deposit has been actually paid or handed over by the stake-holder to the winner.

In Scotland it is part of the common law that all betting transactions are *sponsiones ludicrae*—matters not serious enough to engage the attention of the courts. The practical effect of this principle is that no action lies on a betting contract either to compel payment of winnings, or to compel repayment of losses which have been paid. Though the Scots courts will not decide a dispute as to who is the winner of a bet, nevertheless, if the winner is not in dispute and a stake has been deposited with a stake-holder, Scots law, differing in this respect from English law, will compel the stake-holder to pay or deliver the stake to the winner. The acts of 1845 and 1892, which govern the law concerning bets in England and Ireland, do not apply to Scotland; for it was thought that the common law of Scotland sufficed to effect the purposes of these acts. The exclusion of Scotland from these acts, however, has had the effect of rendering the law of Scotland in regard to the position of betting agents different from that of the rest of the United Kingdom. Thus in Scotland an action lies at the instance of a betting agent against his employer for the recovery of money disbursed by the agent for behoof of his employer on account of bets lost.

The law as to betting contracts has important applications in the case of 'time bargains' on the Stock Exchange. Where shares are ostensibly bought and sold, but the real intention of both the parties to the contract is merely to pay or receive the differences between the prices on one day and the prices on another day, the sale is merely a device under cover of which the parties gamble on the rise and fall of prices. Accordingly the law, looking at the real and not merely ostensible intention of the parties, treats the transaction as nothing but a bet on the price of the stock at a future day, and the 'differences' cannot be recovered. If the real agreement between the parties was that the stock would not be taken up, but that the account would be settled by payment of differences, the contract is none the less void as being a mere wager, though it bears on its face that one of the parties can demand delivery of the stock.

Betting is not a crime or even an illegal act; but it is a punishable offence to keep a betting-house or to bet in certain ways and in certain places. The particular forms of betting and the particular acts connected therewith struck at by the criminal law are dealt with *s.v.* GAMING. For authorities, see GAMING.

Bettws-y-Coed, a village of Carnarvonshire, where the Conway receives the Llugwy, 15 miles S. of Llandudno Junction by rail. The rich greenery of the vegetation, the waterfalls and streams, the luxuriantly wooded hills all round, with the background of the mighty Snowdon and her sister-peaks, combine to make Bettws-y-Coed almost unique in the variety of its natural beauty. At the 'Royal Oak' is a former signboard, painted by David Cox, who stayed here every year from 1844 to 1856. Pop. (urban district) 1000.

Betty, WILLIAM HENRY WEST, better known as the Young Roscius, born at Shrewsbury in 1791, first appeared on the stage at the age of eleven in Belfast, and achieved an immediate success. For almost five years he sustained the heaviest parts before crowded and enthusiastic audiences, and earned from 50 to 75 guineas nightly. In 1805 Mr Pitt adjourned the House of Commons to permit members to witness the boy's Hamlet. He quitted the stage as a boy-actor in 1808, but after studying for a while at Cambridge, returned to it in 1812. He retired finally in 1824, and lived for fifty years in the enjoyment of the fortune he had so early amassed. He died in London, 24th August 1874.

Betul, a declining town of the Central Provinces, India, 50 miles N.E. of Ellichpur; pop. 5000. Betul district, whose headquarters is Badnur, 3 miles off, is a highland region, rich in forests, and producing coal. Area, 3826 sq. m.; pop. 390,000.

Betula. See BIRCH.

Betwa, a river of Central India and the United Provinces, which, after a north-east course of 360 miles, joins the Jumna.

Beust, FRIEDRICH FERDINAND, COUNT VON, German statesman, one of the most prominent modern politicians, was born at Dresden, January 13, 1809. Having conceived early a liking for politics, he devoted himself to diplomacy, and was employed by his government in various capacities in Berlin, Paris, and London. As minister for foreign affairs for Saxony, he, in 1849, declared against the adoption of the new German constitution, but in 1863 he supported the rights of the smaller German states on the Sleswick-Holstein question. In 1866, however, his friendship for Austria induced him to join that country in the war with Prussia, against the wishes of at least the liberal party in Saxony. He afterwards entered the service of Austria, and rose in 1867 to the head of affairs. The chief result of his policy in the reorganisation of the empire was the reconciliation of Hungary, although he afterwards disclaimed the honour of introducing dualism into the empire, and declared that he did so because only Déak's plan would satisfy Hungary. A zealous Protestant, he was an opponent of the Ultramontanes, and his tenure of office saw the removal of Jewish disabilities, and the establishment of civil marriages. Having failed in 1870 to keep his engagements to France, he resigned the office of chancellor in 1871, and though he was afterwards ambassador at London (1871-78) and Paris (1878-82), he never again took a prominent part in politics. He died October 24, 1886. See his *Memoirs* (Eng. trans., with an introduction by Baron Henry de Worms, 2 vols. 1887).

Beuthen, a town of Prussian Silesia, 121 miles SE. of Breslau by rail, close to the Polish frontier. It lies in a mining district (mainly Polish, 1921).

and manufactures woollen cloths and earthenware. Pop. (1871) 17,942; (1900) 51,409; (1919) 71,187.

Beveland, NORTH and SOUTH, two Dutch islands in the estuary of the Scheldt. South Beveland is the largest and most fertile of the Zeeland (q.v.) islands. North Beveland is low and marshy.

Bevelled-gear. See GEARING.

Beveren, a town of Belgium, in East Flanders. The principal industry is the making of point-lace. There is a noticeable church. Pop. 11,000.

Beveridge, WILLIAM, Bishop of St Asaph, was born at Barrow, Leicestershire, in 1637, and entering St John's College, Cambridge, in 1653, as a sizar, devoted himself to the study of the classical and Semitic languages, on which latter he published a treatise at the age of twenty. In 1661, having obtained his degree of M.A., he was ordained both deacon and priest. After holding various preferments, in which he was remarkable for his devotion to his pastoral duties, he was, in 1704, appointed to the bishopric of St Asaph, having previously refused to accept that of Bath and Wells, on the deprivation of Dr Thomas Ken for not taking the oaths to the government of William III. He died 5th March 1708. His sermons and other works were published in 1824 (9 vols.); and there is another edition in the Library of Anglo-Catholic Theology (12 vols. 1842-46); but *Private Thoughts upon Religion* (1709) is his only work now read.

Beverland, ADRIAN, a Dutch scholar, who, by several of his writings, but more especially by his unorthodox interpretation of the Fall, caused great excitement among the theologians of his day. Born at Middelburg, in Zeeland, about the middle of the 17th century, he had studied law, visited Oxford University, and settled as an attorney in Holland, when, in 1678, he published his pamphlet, *Pecatum Originale*, which not only was burned at the Hague, but led to his own imprisonment, and to his expulsion from Utrecht and Leyden. On his return to the Hague, he wrote *De Stolatæ Virginitatis Jure* (1680), which gave still greater offence than his first work. Soon after, he came to England, where he found a supporter in Isaac Vossius. He became insane, and died in England soon after 1712. His works are now mere bibliographical curiosities.

Beverley, chief town of the East Riding of Yorkshire, and see of a suffragan bishop under York, is 1 mile W. of the river Hull, and 8 miles NNW. of the city of Hull. It trades in corn and coal, has tan-works, and manufactures agricultural implements. Incorporated as a borough in 1573, it elected two M.P.'s till 1870. Here is the superb Gothic minster, or the Collegiate Church of St John, ranking next to York Minster among the ecclesiastical structures of the county, and exhibiting different styles of Gothic architecture, the oldest part being of the 13th century. It is 334 feet long and 167 across the transept; the western towers are 200 feet high. The choir contains the celebrated Percy shrine, of the most exquisite workmanship. The minster has been restored since 1867 by Sir G. G. Scott, by whom, too, was restored the fine cruciform church of St Mary. The 14th-century North Bar is the sole survivor of four old gates. The grammar-school of Beverley is so old that the date of its foundation is unknown. Beverley arose out of a priory founded by St John of Beverley, who was born at the neighbouring village of Cherry Burton, became Bishop of Hexham first, and then of York, and died in 721. The name is a corruption of *Beverlac*, 'lake of beavers.' Pop. (1851) 10,058; (1881) 11,442; (1921) 13,469.

Beverloo, a village of Belgium, in the province of Limbourg, 12 miles NW. of Hasselt. On the heath near is a permanent military camp. Pop. 1000.

Beverly, a town of Massachusetts, on an arm of the Atlantic, opposite Salem, with which it is connected by a bridge, and 18 miles NE. of Boston by rail. It has a good harbour, with fisheries, and manufactures shoes. Pop. 22,500.

Bevis of Hampton, the hero of a popular English medieval romance. The son of Sir Guy, Earl of Hamtoun, who was treacherously murdered by Divoun, emperor of Almayne, he was given by his false mother to some heathen merchants to be sold for a slave among the Paynim. By them he was carried to Ermony, where he soon became dear to King Ermyne, and dearer still to his only daughter, the lovely Josian. His chief exploits were the overthrow of Brademond of Damascus, of a monstrous boar, of the giant Ascapard whom he spared to become his squire, and of a dreadful dragon near Cologne. His famous sword Morglay he won in battle; his horse Arundel was the gift of Josian. Still more romantic episodes in his story are his carrying his own death-warrant in a sealed letter to the vassal Brademond, his escape from his noisome dungeon after seven years' imprisonment, and recovery of his wife who had preserved his love, though nominally the wife of King Ynor of Mombraunt. He next returned to England to avenge his father's death, then sailed for Ermony and defeated Ynor in a desperate battle. His last great fight was in the streets of London, when he slaughtered sixty thousand citizens, and forced King Edgar to grant him terms. Thirty-three years he then spent in love and perfect happiness at Ermony, dying at the same moment as his wife, while his famous steed Arundel had died just before. The romance was edited by Dr E. Kölbing for the Early English Text Society in 1885-94.

Bewcastle, a village of east Cumberland, 10 miles NE. of Brampton. Pop of parish, 600. A headless stone cross in the churchyard, 14½ feet high, bears an English runic inscription, which, according to some, shows the cross to belong to the latter half of the 7th century. Others date it four or five centuries later. See RUNES.

Bewdley (formerly BEAULIEU, from its pleasant situation), a municipal borough on the right bank of the Severn, Worcestershire, 14 miles NNW. of Worcester, on the Severn Valley Railway. Till 1885 Bewdley returned one member to parliament. It has manufactures of leather, combs, malt, carpets, and iron and brass wares. Near the town is a public park of 400 acres. Bewdley in the 13th century had a right of sanctuary for those who had shed blood. Henry VII. built a palace at Bewdley for his son Arthur, married here by proxy to Catharine of Aragon. Pop. 2300.

Bewick, THOMAS, to whom the modern revival of the art of wood-engraving is mainly due, was born at Cherryburn, Ovingham, Northumberland, August 12, 1753. His father was a farmer and the lessee of a colliery, and during his early years he enjoyed the ordinary life of a country boy, greatly interested in field-sports, and laying the foundation of that knowledge of the face of nature and of the appearance and habits of her living creatures, which afterwards so strongly influenced his artistic productions. Soon he began to depict the things that he had seen, embellishing the margins of his school-books, and sketching with chalk on floors and on the flat stones of the churchyard. At the age of fourteen he was apprenticed to Ralph Beilby, a Newcastle engraver, who turned out work of the most miscellaneous description, and the first woodcuts that he produced were a

series of diagrams illustrating Dr Hutton's *Mensuration*, published in 1768-70. In 1776, after the expiry of his apprenticeship, Bewick settled as an engraver in London; but the ways of the metropolis were little to his taste, and in less than a year he returned to Newcastle. Soon after, he became the partner of his former master, and taking his brother John Bewick (born 1760, died 1795) as an apprentice, he executed, probably with his assistance, the woodcuts for an edition of *Select Fables*, published in 1784. Towards the close of the following year Bewick began to work upon the blocks of the animals and of the vignettes and tailpieces of his *History of Quadrupeds*, issued in 1790, which fully established his reputation as an engraver. They were mainly drawn and cut in the evenings, after the ordinary routine of the shop was ended; and the accompanying letterpress was compiled by his partner. During the progress of this work he executed in 1789 his 'Chillingham Bull,' a large woodcut, which some have regarded as his masterpiece.

The success of the *Quadrupeds* led to the publication of a similar *History of British Birds*, in which the artist's highest powers were manifested, and which, like his other great works, has appeared in numerous successive editions. The first volume, dealing with land-birds, was issued by the firm in 1797, and the second, on water-birds, in which he was aided by such talented pupils as Johnson and Clennell, was published by Bewick alone in 1804. The figures of the various birds are rendered with the utmost spirit and accuracy, and as examples of powerful and finely decorative arrangements of black and white, nothing could surpass his 'Eagle Owl,' his 'Short-eared Owl,' and his 'Goldfinch.' The tailpieces are vivid renderings of landscape and of rustic life, and are frequently touched with a homely and most vigorous humour. In technical method these illustrations show an immense advance upon all previous examples of wood-engraving. Self-taught, and working from his own designs, Bewick instinctively adopted such methods as were in truest harmony with the especial capabilities of his material, working with white lines into the lights, from the black tint given by the untouched block. Each touch of his graver is laid with intention and definite meaning; and while later engravers have far surpassed him in finesse and manual dexterity, and have produced on wood marvellous imitations of other styles of engraving and surprising transcripts of the tone and texture of brush-work, Bewick's cuts will always maintain their place as classic in their kind, as standard examples of right aims and true direction in wood-engraving. On the *Æsop's Fables* (1818) he was engaged for six years. Latterly he was assisted by William Temple and William Harvey, and by his son, Robert Elliott Bewick (1788-1849). He died 8th November 1828.

See his own autobiography (1862); Hugo's *Bewick Collector* (1866-68); the Life by Thomson (1882); *Bewick and his Pupils*, by Austin Dobson (1884); and books named at WOOD-ENGRAVING.

Bex, a village in the Swiss canton of Vaud, 26 miles SE. of Lausanne, with great salt-mines, salt-works, and sulphur-baths; pop. 5000.

Bexhill-on-Sea, a health-resort on the Sussex coast, 5 miles SW. of Hastings, was made a municipal borough in 1902; pop. 20,000.

Bexley, an urban district in the west of Kent, 15 miles SE. of London, and 3 W. of Dartford; pop. 21,000.

Bey. See BEG.

Beybars, or BIBARS, the Mameluke commander who in 1250 defeated St Louis at Damietta, became

Sultan of Egypt in 1260, warred victoriously with Christians and Tatars, took Damascus and Antioch, and died at Damascus in 1277.

Beyerland, one of the island-districts of south Holland, and lying between the Maas and the Hollandsche Diep. It is 15 miles long.

Beyerlein, FRANZ ADAM, German dramatist, novelist, and critic, was born at Meissen, 22d March 1871, and studied at Freiburg-im-Breisgau and Leipzig. Two of his works, the novel *Jena oder Sedan* (1903) and the drama *Zapfenstreich* (1903) were much discussed.

Beyle, MARIE-HENRI, a French author, better known by his *nom de guerre*, 'Stendhal,' born at Grenoble, 1783, was painter, government-clerk, soldier, and merchant by turns, and accompanied the fatal Russian campaign of 1812. After some years' residence in Milan, he returned in 1821 to Paris, where he acquired a high reputation as a *littérateur*. He was consul at Trieste and Civita Vecchia from 1830 to 1841, and died at Paris, March 23, 1842. Stendhal's keen powers of criticism and psychological analysis give greater value to his works on art and music than to his romances, although the same piquant style, brilliant wit, and wide knowledge of the world appear in all his writings. His defects are a morbid straining after originality, and an ostentatious cynicism and contempt for moral sentiment. His best novels, which all lack consistency of plot, are *Le Rouge et le Noir* (1830) and *La Chartreuse de Parme* (1839). His principal critical works are *Histoire de la Peinture en Italie* (1817); *De l'Amour* (1822); *Racine et Shakespeare* (1823), which greatly aided the cause of romanticism; *Vie de Rossini* (1824); and *Promenades dans Rome* (1829). His hero Sorel is autobiographical, and lives only for intrigue; *De l'Amour* has been called the breviary of the seducer and the hypocrite. Stendhal was the father of the analytic novel.

See Sainte Beuve's *Causeries du Lundi*, vol. ix.; Bourget's *Psychologie Contemporaine*; Hewlett's introduction to *La Chartreuse*; the edition of his works by Debraye (35 vols. 1913 *et seq.*); and books on Beyle by Paton (1874), Rod (1892), Brun (1900), Chuquet (1902), and Arbelet (1920).

Beypur, a seaport in Malabar district, Madras, 6 miles S. of Calicut; pop. 4000.

Beyrich, HEINRICH ERNST VON, German geologist (1815-96), born at Berlin, studied there and at Bonn, became a museum director and professor in Berlin, and joint-director of the Prussian Geological Survey. He introduced the term Oligocene.

Beirut, or BAIRUT, believed to be the *Berothai* or *Berothah* of the Old Testament (2 Sam. viii. 8 and Ezek. xlvii. 16), and known to the ancients, under the name of *Berytus*, as a Phœnician seaport belonging to Sidon, is a flourishing commercial town, situated in a most picturesque position on the coast of Syria, and at the foot of Lebanon, 55 miles from Damascus, and 147 from Jerusalem. It was for a few years in the hands of the Christians (12th century), and was subject successively to the Saracen, Seljuk, and Turkish sultans. In 1840-41 it was bombarded by the British fleet under Sir C. Napier, taken from the Egyptians, and delivered over to the Turks. The French occupied it 7th October 1918, attached it, somewhat loosely, to Lebanon, and made it the seat of the Syrian government. Beirut imports Manchester goods, woollens, Rangoon rice, hides, copper, iron, and coal; exports corn and silk; and there is direct trade to the East in various commodities. Till the harbour allowing ships to discharge cargo at the quays was constructed by a French company in 1894-97, sea-going ships could not approach within

half a mile of the shore, and shelter had to be sought during stormy weather in St George's Bay, about 3 miles from the town. Commerce had very largely increased, but received a check from the political changes that followed the Great War, and suffered seriously from the rivalry of Haifa and other ports. Shipbuilding has received some attention. In 1859 a line of omnibuses, the first ever seen in Syria, was established, and a French company completed in 1863 a good road to Damascus, of which Beyrout is the port; in 1875 an English company completed an extensive system of water-works, and in 1890-95 a railway was made from Beyrout to Damascus. There are French Jesuit and Scottish missionary institutions here, as also the dépôt of the American-Syrian mission, with a school, printing-press, and medical staff, and a Greek patriarchal college. Pop. about 180,000 (70 per cent. Christians).

Beyschlag, WILIBALD (1823-1900), evangelical theologian, born at Frankfort, was appointed professor of Theology at Halle in 1860. His *Leben Jesu* (3d. ed. 1893) and *Neutestamentliche Theologie* (trans. 1895) are standard works; others are *Die Christologie des Neuen Testaments* (1866); *Die Paulinische Theodicee, Röm. 9-11* (1868); *Die Christliche Gemeindeverfassung im Zeitalter des Neuen Testaments* (1874); *Zur Johanneischen Frage* (1876); and *Christenlehre auf Grund des kleinen Lutherischen Katechismus* (1900). In 1876 he founded the *Deutsch-evangelische Blätter*.

Beza, THEODORE (properly De Bèze), next to Calvin the most active and influential of the Genevese reformers, was born of a noble family at Vézelay, in Burgundy, 24th June 1519. He received an admirable education at Orleans and at Bourges in the house of Melchior Volmar, a learned German, who taught him Greek, and also imbedded him with the principles of the Reformation. As early as 1539, Beza became known as a writer of witty and elegant but indecent verses, the publication of which (1548) caused him many bitter regrets in after-days. After studying law at Orleans, he obtained his degree as licentiate of civil law in his twentieth year, and went to live in Paris, where he appears to have spent several years in fashionable dissipation. His handsome figure, together with his fine talents and good birth, opened to him the most brilliant prospects. It was the desire of his relatives that he should enter the church, but a private marriage which he had contracted rendered this impossible.

After a severe illness, during which the sinfulness of his career presented itself to his conscience, he went to Geneva along with his wife, October 1548. Shortly after, he was appointed Greek professor at Lausanne, an office which he held for ten years. In 1550 he published with success a drama, entitled *The Sacrifice of Abraham*, and delivered lectures to crowded audiences on the Epistle to the Romans and the Epistles of Peter. Out of these lectures ultimately grew his translation of the New Testament into Latin. In 1559 he went to Geneva, where he became Calvin's ablest coadjutor, and was appointed a theological professor and president of the college. He had already signalled himself by his work *De Hæreticis a Civili Magistratu Puniendis* (1554), in which, like many other honest but mistaken men, he approved of the burning of Servetus.

Beza was as skilful a diplomatist as a theologian. He induced the king of Navarre to exert his influence on behalf of the persecuted French Protestants, and was persuaded by the latter to attend the conference of Catholic and Protestant divines held at Poissy in 1561. Here his courage and dexterity made a very favourable impression on the French court. While in Paris he often preached before the king of Navarre and Condé. On the out-

break of the civil war he accompanied the latter as a kind of military chaplain, and after his capture attached himself to Coligny. In 1563 he once more returned to Geneva. The following year Calvin died, and the care of the Genevese church now fell principally upon Beza's shoulders. He presided over the synods of French reformers held at Rochelle in 1571 and at Nîmes in 1572. In 1574 he was deputed by Condé to transact important business at the court of the Palatinate; and in 1586 measured himself with the Würtemberg divines. After the death of his first wife in 1588, though verging on seventy, he married again. In 1597 his calumniators spread the extremely foolish report that he was dead and at the last hour had returned to the bosom of the church. The witty patriarch replied in a poem full of sparkling vigour. He died 13th October 1605. He is best known for his translation of the New Testament into Latin, and the *Histoire Ecclesiastique des Églises Réformées de France, 1521-1563* (3 vols. 1580), partly his, but mostly by Jean des Gallards. There are lives by Schlosser (1809), Baum (1851), Heppe (1861), Baird (1900), Picard (1906).

Bezants, or BYZANTINES, are coins of the Byzantine empire. The gold bezant varied in value at different times from a sovereign to half a sovereign; the silver one from a florin to a shilling; are of gold and silver; bear impressions distinct from those of the earlier Roman coins; and were copied in several countries where the Byzantine standard was adopted. The commercial relations of the Eastern empire served to distribute its coinage over almost all the then known world. It was current in India as well as in England till the reign of Edward III. (see NUMISMATICS). Bezants were brought home by the Crusaders, and hence are of frequent occurrence as heraldic charges. Similar figures, when not coloured or (gold), or *argent* (silver), are known in heraldry by the general term of *roundels*. A *bezanty cross* is a cross composed of bezants.

Bezdan, a town of Yugoslavia (Hungary till 1920), in the Bachka, on the canal joining the Theiss and the Danube, from which latter river it is about 3 miles distant. Much hemp is grown. Pop. 8000.

Béziers, a town in the French department of Hérault, is pleasantly situated on a hill in the midst of a fertile country, at the junction of the Orb and the Canal du Midi, 49 miles SW. of Montpellier by rail. It contains some interesting architectural buildings, the principal being the cathedral, a noble Gothic edifice, and the ancient episcopal palace; and antiquarian remains dating from before the time of the Romans. Beziers has manufactures of silk stockings, woollens, gloves, parchment, glass, soap, leather, brandy, and much esteemed confectionery. Population, about 56,000. In 1209 the inhabitants were indiscriminately put to the sword by Simon de Montfort and the pope's legate for having afforded protection to the Albigensian fugitives.

Béziqne (also called *Besique*), a game at cards, played with a double pack, in which the objects are principally to promote in the hand certain combinations which, when 'declared,' entitle the holder to score, and to win certain cards of a particular value. There are practically no restrictions in the game; it is not necessary to follow suit; and two, three, or four players may engage in it.

Be'zoar (through Fr. and Span. from Persian *pād-zahr*, 'counter-poison,' *zahr*, 'poison'), a concretion found in the stomachs of goats or antelopes, and formerly much valued on account of imaginary medicinal virtues, particularly as an antidote to

poisons. Concretions of various kinds are found in the stomachs of herbivorous quadrupeds, very generally having for their nucleus some small indigestible substance which has been taken into the stomach. Sometimes they are of a radiating structure; sometimes formed of concentric layers; sometimes they are principally composed of superphosphate of lime; sometimes of phosphate of ammonia or magnesia. Other concretions found in the intestines, &c. of various animals are sometimes also called bezoar (see CALCULUS). The value of a bezoar being supposed to increase with its size, the larger ones have been sold, particularly in India, for very great prices.

Bhagalpur', or BOGLIPOOR, a town of Bihar, stands on the right bank of the Ganges, here 7 miles wide, and by rail is 265 miles NW. of Calcutta; population, 70,000.—The long, narrow district of Bhagalpur, lying S. of Nepaul, has an area of 4226 sq. m., and is divided into two nearly equal portions by the Ganges. The lowlands are fertile and well cultivated. Indigo is the chief manufacture, and rice and other cereals are the principal articles of export. Of the population (over two millions) 90 per cent. are Hindus.—The division of Bhagalpur comprises five districts.

Bhagavad Gītā ('The Song of the Adorable') is the title of a lengthy theosophical poem which has been incorporated in the great Indian epic, the Mahābhārata, although it is clearly of later date than the rest of that work, its composition being usually assigned to the first or second century after Christ. The leading theme of the poem is the exaltation of the god Vishnu in his human form or avatār of Krishna, and throughout it the god speaks in his own person. In this incarnation Vishnu became the charioteer of Arjuna, a chief of the Pāndus, who were then at war with their kinsmen, the Kurus. On the eve of a battle, when Arjuna is appalled at the thought of slaughtering his own kindred, Krishna sets before him the duties demanded of him as a member of the warrior caste, and at the same time propounds an eclectic system of philosophy of an ethical pantheistic type, laying especial emphasis on the doctrine of *bhakti*, or faith in the Supreme Being, whom he declares himself to be. The poem is divided into three sections, each containing six chapters, called *upaniṣads* ('secret doctrine'), a name which shows the mystical character of the work. In the first section, the duties and observances of caste are directly inculcated, and asserted to be entirely in harmony with the principles of the Yoga philosophy—viz. asceticism and meditation, by which absorption in the Deity, the highest object of humanity, is attained. In the second, the pantheistic doctrines of the Vedānta philosophy are expounded and taught. In the third, the pantheism of the Vedānta is interwoven with the dualism of the Sāṅkhya philosophy. The remarkable similarity existing between many of the ideas and expressions of the poem and those of the New Testament led some scholars (needlessly) to infer an actual borrowing from the latter, a theory vigorously combated by Telang. It is now generally referred to the centuries preceding the Christian era.

The Bhagavad Gītā was edited by Schlegel (Bonn, 1846), with a Latin translation, and by Thompson (1855). It was translated into English by Wilkins (1785), Thompson (1855), Davies (1882), Telang (1875), and in 'Sacred Books of the East,' vol. viii., Chatterji (1887), Sir Edwin Arnold (*The Song Celestial*, in verse, 1885), M. N. Dutt (1895), and Barnett (1905); also into German, French, Italian, and modern Greek, as well as into most of the modern Indian languages. See MAHĀBHĀRATA and SANSKRIT LITERATURE.

Bhagelkhand. See BAGHELKHAND.

Bhagirathi, a branch of the Ganges, regarded as sacred by the Hindus, leaves the Ganges in the Murshidabad district, forms the boundary-line between Nadiya and Bardwan districts, and joins the Jalangi at Nadiya town to form the Hugli. In Nadiya district, on the left bank of the river, is the field of Plassey.—Also the name of a head-stream of the Ganges, rising in Gangotri Peak, Garhwal, United Provinces, which joins the Alaknanda at Deoprayag.

Bhagul. See BAGHAL.

Bhamo', a town of Burma, is at the head of the navigation of the Upper Irawadi, near the Chinese frontier, and 300 miles from Mandalay. It is the northern terminus of the Irrawaddy Flotilla Company. It has long been a mart of Burmese trade with China; and attention has been directed to it, especially since the annexation of Upper Burma by Britain, as an important centre for the development of trade between India and China through western Yunnan, along the trade routes to the eastward. Its trade was rudely disturbed by the Panthay rebellion. It recovered slightly on the re-establishment of the Chinese imperial power in 1874, but has never been fully restored. The railway touches the Irawadi at Katha, 50 miles below Bhamo in a straight line, and at Myikyina, 70 miles above. Pop. 10,000, Burmans, Shans, and Chinese.—The district has an area of 4146 sq. m. It is largely alluvial, and the vegetation is rich.

Bhandara, capital of a district in the Central Provinces, 40 miles E. of Nagpur; pop. 7500.

Bhang, the native name for the Indian variety of Hemp (q.v.) and Hashish (q.v.).

Bhanpura, a walled town of central India, in Indore state, on the Rewa, 60 miles S. of Kotah; pop. 6000.

Bharatpur, or BHURTPORE, the capital of a protected state in Rajputana, is a large town, measuring about 8 miles in circuit, 35 miles W. of Agra by rail. It is worthy of notice chiefly on account of its two sieges in 1805 and 1827. The strength of the place lay in a mud wall, which was practically shot-proof, and a surrounding ditch, which baffled four successive assaults by Lord Lake. On the second occasion, however, Lord Combermere carried the fortress by mining. Pop. (1891) 68,033; (1911) 33,918.—The state has an area of 2000 sq. m.; pop. 500,000, mostly Jāts. It suffers from want of water, having only one river flowing through it; and yet in many parts the soil is rendered highly productive by means of irrigation. The military force of the state amounts to 10,000 men of all arms.

Bhartrihari is the name of a celebrated Indian writer of apothegms, of whom but little is known. A legendary story makes him the brother of King Vikramāditya, who lived about the middle of the 1st century B.C., and relates of him, that after a wild licentious youth, he betook himself in later years to the ascetic life of a hermit. His name has been given to a collection of 300 apothegms, arranged in three centuries or groups of a hundred (*cataka*), but it is likely that these were the work of various authors, but ascribed, according to the Indian custom, to a well-known name. Cheerful descriptions from nature, and charming pictures of love, alternate in these apothegms, with wise remarks upon the relations of life, and profound thoughts upon the Deity and the immortality of the soul. Bohlen published an excellent critical edition (2 vols. Berlin, 1833-50), as well as a successful metrical translation into German (Hamburg,

1835). Bhatrihari has a special interest as the first Indian author known in Europe, 200 of his apothegms having been translated by the missionary, Abraham Roger, in 1653. See editions and translations by Purohit Gopi Nath (1896), Kale and Gurjar (1898), and the translation by Wortham (1886).

Bhatgaon, a town of Nepal, 8 miles SE. of Khatmandu, conquered by the Gurkhas in 1768-69; estimated pop. 30,000.

Bhaunagar (*Bhavanagar*), capital of a Bombay native state (Kathiawar Political Agency), on the Gulf of Cambay, 60 miles NW. of Surat; pop. 60,000.

Bhavabhūti, surnamed 'Sri-kantha,' a great Indian dramatist, who flourished in the first half of the 8th century, and wrote three plays and a domestic drama (see *SANSKRIT*). Bhavabhūti is often compared with Kālidāsa, whom he equalled in vigour and variety, but hardly in genius. All three plays have been translated into English.

Bhel, or **BAEL**. See *ÆGLE*.

Bhils, a pre-Aryan race of central India, inhabiting the states from the Khandesh district of Bombay to the wild hilly tracts of the Vindhya range, north of the Nerbudda River. In 1825 James Outram organised a Bhil corps in order to utilise the war-like instincts of the people, and at the same time the first Bhil agency was formed. The Bhils are dark, diminutive men, perhaps the pygmies of Ctesias (400 B.C.), brave and active, but predatory and superstitious. In normal habit of life they have been nomadic, wandering about with their sheep and goats, and living chiefly on game and fruit. Of over 1,600,000 a few have settled to agriculture, industries, and Hinduism, but the bulk are savages.

Bhilsa, a town of India, in Gwalior state, 26 miles NE. of Bhopal. At Sanchi, near Bhilsa, is a famous group of topes (see *TOPE*). Pop. 8500.

Bhiwani, a town of the Punjab, 37 miles SE. of Hissar by rail. It is the chief commercial centre of the district, and a brisk trade is done in sugar, salt, spices, and metals. Pop. 31,100.

Bhopal, a native state in central India, whose capital, Bhopal (pop. 55,000), is 325 miles SW. of Allahabad. The state has an area of 6900 sq. m., and has long been one of the best-governed native states in India. Founded by Dost Mohammed in 1723, it became dependent on Britain in 1818, and since 1842 the throne has descended through females (the only state in India so ruled), daughter succeeding mother as Begam. A constitution was granted in 1922. The state is Mohammedan, though the mass of the people are Hindus. The state suffered heavily from famine in 1896-1900. Pop. 700,000. See two books (in English) by the accomplished and energetic Begam—an account of her pilgrimage to Mecca, and her autobiography (1912).

Bhuj, the capital of the Indian native state of Cutch, 180 miles SE. of Hyderabad. Its mosques and pagodas, interspersed with plantations of dates, give to the town an imposing appearance from a distance. Pop. 21,600.

Bhurtpore. See *BHARATPUR*.

Bhutan, an independent state in the eastern Himalayas, bounded on the N. by Tibet, S. and E. by Assam, and on the W. by Sikkim. It is divided into East and West Bhutan. With summits exceeding 24,000 feet, the whole surface may be described as mountainous, abounding in sublime and romantic scenery, with a gradual slope from north to south. Generally speaking,

the middle ranges are the most productive. While the south presents but a scanty vegetation, and the north rises far above the limit of perpetual snow, the central regions, at an elevation of 8000 or 10,000 feet above the sea, are covered with the finest forests of oak and pine, with beech, ash, birch, and maple. Amongst wild animals, elephants are numerous, and leopards, deer, wild hogs, bears, and the rhinoceros are also found. The Manās, a tributary of the Brahmaputra, is the most considerable river. Turnips grow well, and nearly all sorts of grain—wheat, barley, rice, maize, and buckwheat—are here and there cultivated on terraces cut out of the sides of the hills. The foreign trade, which consisted in the exchange of commodities for native cloths, rock-salt, rhubarb, Tibet goods, mules, and the famous Tangistan horses or ponies, has declined. The nominal religion is Buddhism, but amongst the common people this goes little further than the recital of a few sacred sentences and the propitiation of evil spirits. From the 16th century till 1907 there was a dual government—the Dharma Raja on the spiritual side and the Deb Raja on the laic. In 1907 the Dharma Raja, who was also the Deb Raja, resigned, and Sir Ugyen Wangchuk, G.C.I.E., was elected first hereditary Maharaja of Bhutan. Foreign relations are now under British control. Polygyny and polyandry are common. The lower orders are dirty in their persons and habits; their food consists mostly of pork, turnips, rice, barley-meal, and brick-tea. They are neat joiners, and their houses of three and four stories have the appearance of Swiss chalets, but are without chimneys. The winter capital is Punakha, on the Bugui River, 96 miles NE. of Darjeeling. The summer capital is Tasichozong (Tassisdun), on the Gudada River, a centre of Lamaism. The original inhabitants, believed to be from Kuch Behar, were called Tephu; they were subdued by a band of Tibetan soldiers 200 years ago, who settled in Bhutan. The Bhutias speak a dialect of Tibetan. In 1772 the raja of Kuch Behar received assistance from the British government against their invasions. Later raids led to the treaty of 1865, when the eighteen Dwars or passes of Bengal and Assam were ceded to the British government in return for a yearly subvention. The area is estimated at 20,000 square miles. Population, 250,000.

See works by Pemberton (1837), Ashley Eden (1864), Strahan (1889), and Sandberg (1898); and *Sikkim and Bhutan*, by Sir J. C. White, political officer in Bhutan (1909).

Bia'fra, **BIGHT OF**, at the head of the Gulf of Guinea, between Capes Formosa and Lopez, into which flow the Niger (q.v.), the New and Old Calabar rivers, the Rio del Rey, the Cameroon, and the Gabun; its islands are Fernando Po (Spanish), and St Thomas and Prince's Islands (Portuguese). Opposite Fernando Po are the Cameroons (q.v.).

Bialystok (a Polish name the Russians spell *Bielostok*), a town in Poland, on the Biala, 45 miles SW. of Grodno. Its castle, now used as a convent, was formerly the 'Versailles of Poland.' Its factories produce woollens, silks, boots, and shoes. A massacre of Jews took place here in June 1906. Pop. 77,000. It gives name to a voyvodship; pop. 1,300,000.

Biana. See *BAYANA*.

Biancavilla, a town of Sicily, on the southwest declivity of Mount Etna, 24 miles NW. of Catania. It has a trade in grain, cotton, and silk. Pop. 15,000.

Bianchini, **FRANCESCO**, antiquary and astronomer, was born in 1662 at Verona. At Padua he

studied theology, mathematics, and botany; and in 1684 proceeded to Rome, where he became intimate with the most distinguished *savants* of the day, and devoted himself to the study of jurisprudence and foreign languages. Alexander VIII. bestowed upon him a rich benefice, and Clement XI. appointed him secretary to the commission for reforming the calendar. He died in Rome in 1729. He was author of various works, but is chiefly remembered in connection with the Meridian Line (q.v.).

Bian'coni, CHARLES, born in Lombardy in 1786, came at the beginning of the century to Ireland as an itinerant vendor of cheap prints. Having accumulated a small capital, he started the first public conveyance between Clonmel and Cahir in 1815, at a time when the peace and the carriage-tax had filled the market with cheap horses and jaunting-cars. The enterprise succeeded, until, 40 years after, Bianconi's cars were working over 4000 miles of road daily. Having realised a large fortune, he retired in 1865, and died in September 1875, at his estate near Cashel. He was a devoted adherent of O'Connell, into whose family both his son and daughter married.

Biard, AUGUSTE FRANÇOIS, a *genre* painter, born at Lyons in 1798, travelled in early life in the Levant, in 1839 visited Greenland and Spitsbergen, in 1858-59 Brazil, and in 1865 travelled round the world. Among his best pictures are the 'Beggars Family,' 'African Slave-market,' 'Fight with Polar Bears,' and 'The Wandering Comedians.' He died in Paris, June 1882. His wife, Léonie d'Aunet (1820-79), separated from him since 1845, was author of some novels, a play, &c.

Biarritz, a favourite watering-place in the French department of Basses-Pyrénées, on the Bay of Biscay, 6 miles SW. of Bayonne. Here, in 1855, Louis Napoleon built the Villa Eugénie for the empress, who already, as Countess de Téba, had been a frequent visitor. Till 1855 a decayed fishing-village, Biarritz is to-day a bright, flourishing little town with 19,000 permanent residents, a fashionable international seaside resort, whose mild climate, proximity to the Pyrenees, Basque country, and Spain, picturesque cliffs, and extensive bathing-beaches (Grande Plage and Côte des Basques), fine hotels and villas, casino, thermal establishment, golf-course, &c., attract thousands of visitors all the year round. Since Queen Victoria's visit in 1889 it has been much frequented by English people, especially in winter.

Bias, one of the Seven Wise Men of Greece, a native of Priene in Ionia, flourished about the middle of the 6th century B.C., famous for his eloquence, his nobility of character, and his apothegms. Among these perhaps the best were: 'Know and then act,' 'He is unfortunate who cannot bear misfortune,' 'So order your affairs as if your life were to be both long and short,' and that addressed to the irreligious sailors who during a storm were loudly calling on the gods, 'Be quiet, lest the gods discover that you are here.' Once when his fellow-townsmen in alarm before an enemy were hastily carrying off their valuables, Bias was seen without a burden, and being asked why he was not occupied like others, replied in words which in Latin became a proverb, *Omnia mea mecum porto* ('I carry all my goods with me').

Bias. See BEAS.

Bias. See BOWLS.

Bib, also called BRASSY, POUT, or WHITING POUT (*Gadus luscus*), a fish of the same genus as the Cod, Haddock (q.v.), and Whiting, pretty common on many parts of the British coasts, found also on those of Norway, Sweden, Greenland, &c. It is

seldom more than a foot long, but differs from the other British *Gadidae* in the great depth of its body, which equals at least one-fourth of the entire length. The back is arched, and the nape exhibits a rather sharp ridge. The head is invested with a loose dilatate membrane. The names Bib and Pout, both originally local English names, were at one time supposed to refer to distinct species (*G. lusca* and *G. barbata*), but these, probably, are really one.

Biberach, a town of Württemberg, delightfully situated on the Reiss, 23 miles SSW. of Ulm. It retains its old ramparts and towers, and in front of the theatre is a monument to Wieland, who was born in the neighbourhood. There are manufactures of machinery, artificial flowers, leather, bells, children's toys, &c. Pop. 9000. In 1796 Moreau won a great victory over the Austrian general Latour at Biberach, the latter losing 4000 prisoners. Here also, in 1800, Saint Cyr defeated the Austrian general Cray. Biberach fell into the possession of Baden in 1802, but four years afterwards was ceded to Württemberg.

Bi'berich. See BIEBRICH.

Bib'iri and **Bib'irine**. See GREENHEART.

Bible. The Bible is the sacred book of the Christian religion. What the Koran is to the Mohammedan world, or the Vedas to India, or the Chinese Classics to Confucianism, or the Zend-Avesta to Zoroastrianism, the Bible is to Christianity. Not that the Bible is to be put on the same level with these other books. Reasons will be given later on in this article to prove the supremacy of the Christian Bible over all other forms of sacred literature.

The Origin of the Term.—The term 'Bible' appears to have been first used in English in catalogues of the 9th and 10th centuries. But the English word is derived from the Greek *ta Biblia* (τὰ βιβλία), a plural form denoting a collection of papyrus rolls, papyrus being the material on which books were written in the early centuries of our era. Though a plural in Greek, the word came, on account of its termination, to be used as a feminine singular in late Latin, and from the Latin it passed over in this form into modern languages—e.g. *la Bible*, *die Bibel*, &c. The term *Biblia* (βιβλία), when used in this connection, was originally qualified by some such adjective as 'holy' or 'sacred' or 'divine'—e.g. the Divine Books; but in course of time the adjective was omitted, and the term 'the Book' or 'the Books' was used by itself, signifying the book *par excellence*, or 'the Book of Books.' The term is never used, of course, in the Bible itself. The contents of the Old Testament are described in the Apocrypha and the New Testament by such phrases as 'the holy books' (1 Mac. xii. 9), 'the book of the law' (1 Mac. i. 56), 'the book of the testament' (1 Mac. i. 57), the 'scriptures' (frequently in the New Testament), 'the holy scriptures' (Rom. i. 2), 'the law and the prophets' (Acts, xxviii. 23), 'the law' (John, xii. 34).

The two Divisions of the Bible.—The Bible is divided into two parts, known respectively as 'the Old Testament' and 'the New Testament.' The term 'Testament' is a mistranslation of a Greek word which means 'covenant.' The relation between God and his people is generally described in the Bible under the form of a covenant. The first covenant is the constant theme of the Old Testament. This covenant, however, proved ineffectual, and the New Testament records how a new covenant which had already been promised to Jeremiah (xxxi. 31) was established through the incarnation and death of Jesus Christ (1 Cor. xi. 25; Heb. viii. 7).

It is a significant fact that the coming of Christ

was regarded as so supreme an event that a clear line of cleavage was drawn between the literature of the preceding age and the literature which was inspired by his life, teaching, and death. Christ is the centre of the Bible. The New Testament is not merely an appendix to the Old Testament: it is the culmination and climax of the revelation of God for which the Old Testament prepares the way.

The Relation between the two Testaments.—Why have we two Testaments, and what is the relation between them? The answers to this question have taken various forms. In early times Marcion and the Gnostics maintained that the two Testaments contained contradictory revelations, and emanated, therefore, from different sources, the Old Testament being the work of the Demiurgus or evil principle in the universe, the New Testament the work of the Supreme God. Such a theory, however, is diametrically opposed to the teaching of the New Testament itself. The New Testament always assumes that the Old Testament is in the same line of revelation as itself. A more common theory has often maintained that the two Testaments are upon the same spiritual level, and contain exactly the same form of revelation. As Augustine put it, 'Novum Testamentum in Vetere latet. Vetus Testamentum in Novo patet.' When it has been impossible to discover the doctrines of Christianity in the plain statements of the Old Testament, resource has been had to the allegorical method of interpretation, and texts have been wrested and distorted into strange meanings. There are traces of this method even in the New Testament, notably in Paul's uses of the allegory of Ishmael and Hagar in the Epistle to the Galatians. It is in the Epistle of Barnabas, however, which deals with the problem of the relation of the two Testaments, that we find the most extreme illustrations of the application of the allegorical method. For instance, Barnabas cites inaccurately the statement of Genesis with regard to the 318 servants of Abraham, and asks what is the significance of this particular number? There must be a mystical meaning, he says, lying behind it. The Greek equivalent for the number 318 is formed of the letters T I H. Now T represents the cross, and I H (H representing E long in Greek) are the first two letters of the word Jesus. The 318, therefore, typifies the death of Christ upon the cross. Equally remarkable is Barnabas's explanation of the law which prohibits the use of certain forms of food. 'Moses spoke with a mystical reference: "Neither shalt thou eat," says he, "the eagle nor the hawk, nor the kite nor the raven." Thou shalt not join thyself, he means, to such men as know not how to procure food for themselves by labour and sweat, but seize on that of others in their iniquity.' It is obvious from these examples that by the adoption of this method it was possible to find in the Old Testament all the doctrines of the New, and put the two books on the same level of spiritual value.

Both these theories as to the relation between the two Testaments are radically wrong. The two Testaments are not opposed to each other, but neither are they identical. It is a travesty of truth and honest exegesis to attempt to find all the doctrines of Christianity in the Old Testament. God's revelation is uniform, but it is progressive. The Old Testament is the preparation for the New. It contains the record of the divine education of Israel to enable it to receive the full and final revelation of God in Christ Jesus. As the author of the Epistle to the Hebrews puts it, 'God having of old times spoken unto the fathers in the prophets by divers portions and in divers manners, hath in these last days spoken unto us by his Son.' The fragmentary revelation of the Old Testament made

the complete revelation of the New Testament possible. 'A revelation ready made and given to man,' says Max Müller, 'like a language formed in heaven, would have been like a foreign religion which men could not understand. . . . If we have any revelation from God at all, we have it at the heart of a great historical development.'

THE OLD TESTAMENT.—*The Purpose of the Old Testament* is, therefore, to prepare the way for the New. Its true function is educative and preparatory. The words which St Paul uses of the law may be applied to the whole of the Old Testament, 'It is a schoolmaster to bring us to Christ.' If it be objected that while it is true that 'natural reason is slow and gradual in its processes,' it is reasonable to suppose that an 'Omnipotent Being will communicate his revelation summarily and by a single act,' we must remember, as Dr Mozley has said, 'when we speak of the Omnipotence of God, we do not mean that he can simply and nakedly do anything that can be stated in words. God can no more force an immediate moral enlightenment upon an existing age and antedate a high moral standard by two thousand years, than he can instantaneously impart a particular character to an individual.' The Old Testament starts with the Hebrew people at the ordinary Semitic level. Their religion is similar to that of other Semitic peoples. It records the story of how they broke away from the common Semitic stock, and in the process of centuries attained to such a high religious development that they became the soil out of which Christianity sprang. There is an infinite gulf, for instance, between the ordinary Semitic conception of God and the conception of God which we find portrayed in the prophecies of Deutero-Isaiah, and that gulf represents the measure of Israel's development, at any rate in one of its aspects. The Old Testament describes the road which had to be traversed before this goal was reached. From beginning to end it is one long *preparatio evangelica*. Nearly every truth taught by Jesus has its antecedents in the Old Testament, and almost every doctrine in the New Testament is shadowed and adumbrated in the Prophets and the Law. As Delitzsch has remarked, 'There is nothing clearly revealed in the New Testament which was not already stirring in the Psalms.' From another point of view, it may be said that the Old Testament stated the problems for which Christianity provided the solutions. The two cries of Job, 'Oh that I knew where I might find him,' and 'How can a man be just with God?' represented the sense of need which the Old Testament had created. Splendid as is the religious development of the Old Testament, it does not lead us to any satisfactory goal, and it ends with a feeling of its own inadequacy. Apart from the New Testament, it leaves us with a sense of unsolved problems, and an unutterable longing for further light and truth.

The Character of the Old Testament.—From what has already been said, it will be obvious that the Old Testament is not a manual of science, or ethics, or doctrine. It is the record of the self-manifestation of God in the history of Israel. Israel was selected out of all the nations of the world to be the channel of God's revelation of himself to mankind. We may assume that the ground for this choice lay in the fact that Israel possessed a native genius for religion. Just as the Greeks were renowned for their artistic instincts and the Romans for their instinct for government, so the Jews seem to have been distinguished for their capacity for religion. The modern discovery of the Tel-el-Amarna tablets and the code of Hammurabi has revealed to us with remarkable vividness the common Semitic inheritance which formed the starting-point

of Israel's development. We know now that much which used to be regarded as original in the Old Testament was really part of the legacy of the prehistoric past. The Old Testament shows how the old traditions were purified and ennobled in the gradual process of Israel's development. We see the steady emergence of new ideas—the change in the conception of God, for instance, the development of the sense of sin and the yearning for forgiveness, the rise of the belief in the advent of a mediator, the slow emergence of the doctrine of the future life.

Estimated by the ordinary standards, there is small ground for pride in the course of Israel's history. Only for a brief period in the time of David and Solomon did it ever attain to any degree of national splendour. Israel was always one of the 'little nations' of the world. For a large portion of its history it formed the buffer state between two great empires, and was constantly being subjected to invasion and devastation. The narrative is one long record of sorrow and catastrophe. But its own national failure was the cause and secret of its spiritual achievement. Its very calamities cast it upon God, and created an intensity of faith which could scarcely have been produced if its history had been more splendid. It was the stress and conflict which followed the return from Egypt that marked the first great step in Israel's religious development, and it was the tragedy of the exile in Babylon that formed its culmination. And it is the work of the Old Testament to show how, in crisis after crisis of the nation's history, the noblest truths of faith were born and grew to maturity.

The Growth of the Literature of the Old Testament.—The Old Testament contains the literature of the people of Israel during some six or seven hundred years of the nation's history. The 8th, 7th, and 6th centuries B.C. were the really creative periods: what literature existed in the pre-prophetic period, and what form it assumed, is more or less a matter of conjecture. We know that collections of lyrical poems had been made in earlier times, for quotations taken from them have been incorporated in our historical books. 'The Book of the Wars of Yahweh,' cited in Numbers, xxi. 14, 15, and 'the Book of Jashar,' quoted in Joshua, x. 12-13, seem to represent two such collections. The best specimens of this early poetry are to be found in the song of Deborah (Judges, v.), the elegy for Saul and Jonathan (2 Sam. i. 17), the song of the well (Num. xxi. 17, 18), the sword-song of Lamech (Gen. iv. 23, 24), the song of Moses at the Red Sea (Exodus, xv.), &c. We know, too, that some attempts at historical writing were made in the pre-prophetic era. Certain of the sources used in our existing historical books must have been in existence from very early times. J and E—two of the most important documents out of which the Pentateuch was constructed—must have been written before 750, and may possibly have been as early as 900 B.C. (See BIBLICAL CRITICISM.) But it was not till the last half of the 8th century that this literature began to take shape in anything like the form in which we possess it to-day. Between 750 and 700 the first great outburst of literary activity occurred. To this period belong Amos, c. 750; Hosea, c. 745-735; Isaiah, 740-690; Micah, 720-708. The Books of Samuel, too, must have been composed substantially in their present form before 700. The next half-century is comparatively barren from a literary point of view, but between 650 and 586 (the date of the fall of Jerusalem) we have another outburst of prophecy—e.g. Zephaniah, c. 630-605; Nahum, c. 625; Habakkuk, c. 605; Jeremiah, c. 626-586; Deuteronomy in its earliest form, c. 621; and the Book of Kings, c. 600. The period of the exile (586-538) was also very productive.

To this period belong Ezekiel, c. 592-570; Deutero-Isaiah; Lamentations, c. 540; and certain parts of the Psalter. To the century which followed the return from the exile, 538-444, belong the Priestly Code; Haggai, c. 520; Malachi, c. 450; parts of Zechariah, 520-518. In this period the Pentateuch was constructed out of J E P D. Chronicles, Ezra, and Nehemiah belong to the period 300-250—possibly also Canticles and Ecclesiastes. Esther was a later production, though its exact date seems difficult to fix. Daniel was written about 168, and finally the Psalter was completed about 150.

The Formation of the Old Testament Canon.—Literature is one thing; a Bible is something very different. A Bible implies that the books in its canon are in some way divinely inspired, and contain the message of God to his people. Obviously the contents of the Old Testament do not exhaust the literature of ancient Israel. There are writings, for instance, like the Book of Enoch, which never obtained a place in sacred scripture. When, and under what circumstances, was the collection of books which form the Old Testament first made? The formation of the Old Testament canon was a process, and not an event. It grew up gradually, and five hundred years elapsed between the beginning and the completion of the process. The Old Testament consists of three well-marked divisions: (1) *the Law*, a term which was used to describe the Pentateuch, or rather the Hexateuch, for the Book of Joshua was always closely associated with the Pentateuch; (2) *the Prophets*, a division which includes not merely the prophetic writings, but the earlier historical books as well—e.g. Judges, 1 and 2 Samuel, and 1 and 2 Kings; (3) the *Kethubim* or *Hagiographa*, a collection of miscellaneous writings—Psalms, Proverbs, Job, Ezra, Canticles, &c., in fact all the books of the Old Testament which have no place in the two earlier groups. Now, these three divisions mark three vital stages in the formation of the canon. The earliest Jewish Bible consisted only of the Hexateuch. In fact the Samaritan Bible, which seems to have stereotyped this stage in the development, contains only the Pentateuch. The second Jewish Bible was formed by the addition of the section known as the Prophets, and the third Bible—representing our present Old Testament—is the second expanded by the insertion of the books known as the *Hagiographa*.

When were these three different canons formed? We can be certain that the first canon—the Hexateuch—was constituted at the end of the 5th century B.C., somewhere between 444 and 400 B.C. In the year 444 B.C. the solemn assembly which is described in the ninth chapter of the Book of Nehemiah pledged itself to 'the book of the law of Yahweh their God.' Whether the book alluded to is our Hexateuch, or merely the Priestly Code, cannot be determined with certainty; but we may be sure that even though the reference may be limited to the Priestly Code, yet well within the limits of the century this code was incorporated in the collection J E D (see PENTATEUCH), and directly the incorporation had taken place the whole of the Hexateuch would naturally assume the place of dignity and honour in the popular esteem which had been assigned at first to the Code. The time when the second division of the canon was made is more difficult to fix. We have good grounds, however, for thinking that it must have been added before 200 B.C. The author of the Book of Sirach, writing in his prologue about 130 B.C., says: 'Whereas many and great things have been delivered unto us by the Law and the Prophets, and by others that have followed in their steps, . . . my grandfather, Jesus, when he had much given himself to the reading of the Law and the Prophets

and other books of our Fathers, and had gained therefrom good judgment, was induced also himself to write something pertaining to wisdom and learning.' The date of the grandfather may be fixed approximately at 180 B.C. We see, therefore, that by 180 B.C. the second division of the canon was well established, and other writings besides were beginning to come into consideration. The *third division* of the canon was gradually added during the period 200 B.C.–90 A.D. As we have already seen, at the time when the prologue to Sirach was written (130 B.C.) other books were beginning to be ranked with the Law and the Prophets. And we know that at even an earlier date, when the main body of Sirach was written (180 B.C.), the author drew upon some of the Hagiographa (e.g. Chronicles, Ezra, and Nehemiah) for the information contained in his chapters on the 'praise of famous men.' In the New Testament several of these later books (e.g. Psalms, Proverbs, Job, and Ecclesiastes) were cited as Scripture. The fourth Book of Ezra (90 A.D.) regards the whole of the contents of our present Old Testament as canonical, and so probably does Josephus (90 A.D.). The authoritative settlement of the canon was made at the Jewish Synod of Jamnia in 90 A.D., when the Old Testament became established in the form in which we possess it at present. The decree of the Council of Jamnia did not, however, at once secure universal acceptance. For some time there was hesitation about the acceptance of Canticles and Ecclesiastes, which were the two last books to secure canonicity. And even as late as 170 A.D. Melito, the Christian bishop of Sardis, felt himself unable to specify the exact contents of the Old Testament till he had visited the country in which these books had originated and investigated the matter for himself. Still, for all practical purposes, we may say that, as far as Palestine was concerned, the canon of the Old Testament was authoritatively settled by the Synod of Jamnia. If we ask the reason why a process of evolution which had been going on for five hundred years was suddenly brought to an end, the answer is to be found in the fact of the fall of Jerusalem, which resulted in the destruction of the Temple. Before 70 A.D. the Temple had been the centre and soul of the Jewish religion. When its Temple was destroyed, it had to find a new centre, and it turned to its sacred writings. From this time onwards the Bible took the place of the Temple, and Judaism became the religion of a book. We may be fairly confident that had it not been for the destruction of Jerusalem the Old Testament canon would not have been stereotyped at so early a date, nor would the book have obtained so dominant a place in Jewish religious life.

The Alexandrian Canon.—But if the process of the evolution of the canon was arrested in Palestine by the Synod of Jamnia, it still continued in Alexandria. In Alexandria a *fourth division* was added, containing the books now known as the Apocrypha (see APOCRYPHA). These writings may be classified as follows: (1) *Historical Books*—1 Esdras, 1 and 2 Maccabees; (2) *Didactic Works*—The Wisdom of Solomon, the Book of Sirach (Ecclesiasticus); (3) *Religious Romances*—Tobit and Judith; (4) *Prophetic or Apocalyptic Works*—Baruch and 4 Ezra; (5) additions to the Old Testament—e.g. to Esther and Daniel. All these works (with the exception of 4 Ezra) are found in the Greek version of the Old Testament known as the Septuagint. The Apocrypha, therefore, represents the difference between the contents of the Hebrew Bible and the Septuagint plus 4 Ezra. The controversy with regard to the Apocrypha is a conflict between the Palestinian and Alexandrian canons. Up to the time of the Reformation, in spite of a few protests, the Alexandrian canon was generally ac-

cepted by the Christian Church, and the Apocrypha regarded as an integral part of Holy Scripture, and that position was authoritatively adopted for Roman Catholicism by the Council of Trent. In Protestantism, however, a return was made to the Palestinian canon, though the additions made by Alexandria were often accepted as 'an example of life and instruction of manners.' Had not the destruction of Jerusalem precipitated the completion of the canon in Palestine, there is little doubt that this *fourth division* would have gradually won recognition, and now be occupying an unchallenged place in the Old Testament.

The Language and Text of the Old Testament.—The Old Testament was written in Hebrew, with the exception of certain parts of Ezra and Daniel, which are in the vernacular Aramaic. Originally written Hebrew consisted purely of consonants, the vowels being mentally supplied by the reader. It was not till the 6th century of our era that vowel signs were introduced into the text. The absence of vowels left the door open for confusion and misinterpretation, and it was to avoid this that a school of Jewish scholars, known as the Massoretes, between the 5th and 8th centuries of our era, undertook the vocalisation and standardisation of the Hebrew text. The Hebrew text in use to-day is the result of their labours, and is called Massoretic. Our earliest complete Hebrew manuscript dates probably from 916 A.D., which is 550 years later than the earliest MS. of the New Testament. We have, therefore, to face the fact that there is an interval of 1600 years between the time of Amos and our earliest record of his writings, and an interval of more than 1000 years between the composition of the latest book in the Old Testament—probably Daniel—and our earliest Hebrew MS. Our Hebrew MSS., it is true, are in singular agreement with each other, and do not exhibit anything like the number of variant readings which we find in New Testament MSS.; but that is only because they are all of them comparatively late, and based upon the standard text of the Massoretes. That corruptions had unfortunately crept into the Hebrew text before the Massoretic scholars took it in hand is, unfortunately, only too evident. If we compare Psalm xviii., for instance, with the version of the same hymn which we find in 2 Sam. xxii., we become conscious of a large number of variations and differences in the two texts, most of which must be due to mistakes on the part of a copyist. Then, too, there are cases where the Hebrew text is absolutely unintelligible. For instance, in 1 Sam. xiii. 1 we find the extraordinary statement, 'Saul was a year old when he began to reign, and he reigned two years over Israel.' This statement is palpably absurd. Something has obviously gone wrong with the text, probably owing to an accident in copying. It is unfortunate that in the case of the Old Testament, as the Revisers remind us in the preface, 'the Received or, as it is commonly called, the Massoretic text has come down to us in manuscripts which are of no very great antiquity, and which all belong to the same family or recension.' Most modern Hebraists maintain that the existing MSS. of our Old Testament are derived from a single MS. of a date not earlier than the 1st or 2d century of our era. This means that since we have representatives of only one recension, we have no available data in Hebrew for applying the principles of textual criticism to the Massoretic text. Fortunately, however, we possess the Septuagint (see SEPTUAGINT) or Greek translation of the Old Testament, the earliest parts of which belong to the 2d, possibly the 3d, century B.C., and which, therefore, was based upon an earlier Hebrew text than we possess in our available MSS. By the use of the Septuagint

we are able to reconstruct this Hebrew text and use it as a criterion for testing the accuracy of our own Hebrew MSS. We have, however, to make many allowances. The Septuagint translation may not be, indeed often it is not, an accurate rendering of the Hebrew, and sometimes we are not able to discover with any degree of certainty what the original Hebrew text actually read. Still, there is no doubt that when scientifically applied the judicious use of the Septuagint is of immense value in correcting obvious mistakes and providing an explanation of difficult passages. Three revised versions of the Septuagint were made in the early Christian centuries by Aquila, Symmachus, and Theodotion respectively, but, unfortunately, only fragments of these have survived. It is interesting to remember that in the year 240 A.D. Origen made an attempt to provide material for constructing a scientific text of the Old Testament in his *Hexapla*. In the *Hexapla*, in six parallel columns, Origen put side by side (1) the Hebrew text, (2) the transliteration of the Hebrew text into Greek letters, (3) the Septuagint, (4) Aquila, (5) Symmachus, and (6) Theodotion. Other versions of the Old Testament also exist—e.g. the Syriac, the Latin (especially Jerome's translation, known as the Vulgate), the Coptic or Egyptian versions, the Targums or Aramaic paraphrases of the Old Testament—but these are mostly of a later date, and assume the Massoretic text, and so are not nearly as valuable for the purposes of textual criticism as the Septuagint.

The Permanent Value of the Old Testament.—If the Old Testament is simply preparatory, if it represents merely the education of the Jewish people for the reception of Christianity, if it has been superseded by the New Testament, why should it be still retained as part of the Christian Bible? This question was raised in an acute form by Professor Bury in his *History of the Freedom of Thought*. 'It was unfortunate,' he says, 'that the early Christians included in their scripture the Jewish writings which reflect the ideas of a low stage of civilisation, and are full of savagery. It would be difficult to say how much harm has been done, in corrupting the morals of men, by the precepts and examples of inhumanity, violence, and bigotry which the reverent reader of the Old Testament, implicitly believing in its inspiration, is bound to approve. It furnished an armoury for the theory of persecution. . . . Christianity, by adopting books of a long-past age, placed in the path of human development a particularly nasty obstacle' (pp. 53, 54). Such an argument as this seems to be wilfully blind to the great and permanent contributions which the Old Testament made to Christian thought. If we were to confine ourselves merely to those parts of the book which represent the lower and more primitive stages of the religion, there would be something in Professor Bury's position; but when we come to the higher regions of Old Testament thought, we instinctively feel that Christianity would be irreparably poorer if it were deprived of the lofty spiritual feeling of the Psalms, the strong ethical note of the Prophets, the wise statements of the Book of Proverbs, and the soul-strivings of the Book of Job. We must never forget that Jesus nourished his soul upon the Old Testament, and used it frequently in his teaching. The theology of St Paul is simply saturated with Old Testament ideas. If Jesus and the Apostles and the early Church found the Old Testament a source of inspiration and illumination, if much that is best in their teaching is drawn from this source, it would be a disaster for the modern Church lightly to set aside a book on which its founder and first leaders have set their seal. The essence of the Old Testament teaching was assumed

to be part and parcel of the Christian faith. If the Old Testament had not already been in existence, the New Testament must have taken a very different form.

Moral Difficulties in the Old Testament.—There are, of course, some moral difficulties in the teaching of the Old Testament, and it is to these that Professor Bury is specially referring. The sacrifice of Isaac, and Jephthah's vow, for instance, have always been regarded as difficult to reconcile with the spirit of Christianity. Then there are cases in which altogether disproportionate punishment seems to have been inflicted by God upon offenders—e.g. on Nadab and Abihu for offering the wrong kind of incense (Num. iii. 4). The murder of 50,000 people for looking into the ark seems also difficult to square with a true conception of Christian charity (1 Sam. vi. 19). The command to exterminate the Canaanites, too, was an extreme military inhumanity, to say the least (Deut. xx. 17). Then there are the imprecatory Psalms, in which the psalmist prays in no measured terms for vengeance to be exacted upon his enemies (Psalms, vii., xxxv., lxi., lxxix., cx.). What are we to say with regard to these elements? It is quite clear that the modern mind, if it is at all imbued with the spirit of the New Testament, cannot accept them as part of a divine revelation. There are some considerations, however, which serve to mitigate what seems to be a flagrant contradiction between the moral teaching of the Old Testament and that of the New upon such points as we have mentioned. Firstly, we must remember that the Old Testament is the record of the slowly evolving revelation of God. Obviously these moral defects belong to the beginning of the process, and not to the end. When they occur in the later books, we must regard them as the recrudescence of an earlier spirit which had not yet been completely mastered. Then, secondly, we must never forget that the divine revelation in the Old Testament was manifested through fallible men, and, as Dr Bennett has put it, 'there was room for an imperfect understanding of the divine communication.' Prophets and psalmists were subject to limitations of character, knowledge, and sympathy, and sometimes they may have mistaken human prejudice and vindictiveness for the teaching of God. It would be a fatal mistake, however, to ignore the greatness and grandeur of their message because at times they have confused human passions with divine inspiration.

The Religious Value of the Old Testament.—The value of the Old Testament lies in the importance of the contributions which it has made to our knowledge of God and the relations between God and man. It is this that gives it—next, of course, to the New Testament—a supreme place in the sacred literature of the world. There is nothing in the Vedas or the Koran or the Analects of Confucius or the Zend-Avesta to compare with the sublime conception of God which we find in the pages of Deutero-Isaiah. Other nations have attained, of course, to some form of monotheism, but not to so pure and ethical and universal a monotheism as we find at the climax of Old Testament thought. The God of the later prophets is omnipotent ('All nations before him are as nothing') and holy, but he is tender and compassionate and benevolent as well ('Like as a father pitieth his children, so the Lord pitieth them that fear him'), and it is this combination of attributes that constitutes the greatest contribution of the Old Testament to theology. When we remember that the Hebrews started simply with a tribal deity, with few, if any, ethical qualities, the achievement becomes all the more remarkable. Such a development is absolutely unique in the history of

religion. Then, too, the evolution of the sense of sin, which is the natural counterpart of the doctrine of God, is such as we can scarcely find a parallel to elsewhere. The problem of suffering, moreover, which is the despair of most religions and philosophies, receives a most unique and sympathetic treatment in the pages of the Old Testament, and if no real solution is found, there are manifold hints and suggestions which bring comfort and relief to the baffled soul. That the Old Testament did hold out a very lofty moral ideal, and create a very high type of spiritual life, the devotional hymns in the Psalter afford sufficient proof. There is nothing in any other sacred literature to match the confidence and the faith and the unquenchable hope, even in the face of national and private calamities, which are evinced in most of these sacred poems, and it is these elements which have given the Psalter a permanent primacy among books of devotion. Then, too, the belief in the infinite value of the individual to God, which marks the later stages of Old Testament thought, is a unique contribution to faith and theology. The dim conception of a future life in the greater part of the Old Testament is sometimes regarded as a defect, but we must never forget that before the Old Testament closes that belief has become one of the strongest articles in its creed.

Social and Ethical Teaching.—Jesus summed up the whole duty of man in the words, 'Thou shalt love the Lord thy God with all thy heart, . . . and thy neighbour as thyself,' and these words represent not merely the language but the spirit of the ethical teaching of the Old Testament. There is much in the Levitical law, of course, that seems puerile and trivial to-day, but the motives and principles that lay behind these enactments are altogether beyond criticism. Huxley said of it, 'There is no code of legislation, ancient or modern, at once so just and merciful, so tender to the weak and the poor, as the Jewish law.' And in the prophets, too, the ethical note is always predominant. There is no divorce in Judaism between morality and religion. In the Old Testament, as in no other sacred literature, morality is made an integral part of religion. Then, too, few codes are drawn up with such a direct sympathy with the interests and needs of the poorer classes. The institution of the year of jubilee, for instance, provided that land which had been sold was to be returned every fifty years to the family which had originally owned it. The object of this provision was obviously to prevent the land getting into the hands of a few land-owners; and if the enactment had been carefully carried out, many abuses would have been prevented. The prophets are continually protesting against the avarice of the rich in this matter. 'Woe unto those,' says Isaiah, 'who join house to house, who add field to field, till there is no more room, and ye are settled in the midst of the land' (v. 8). Micah is equally vigorous in denouncing men who 'covet fields and seize them, who covet houses and appropriate them' (ii. 2). Ezekiel, too, protests against the social conditions of his times and the oppression of the poor by the rich (cf. xxxiv. 18); and the Book of Job denounces in no measured terms the evil of 'sweating' (xxiv. 10). The burden of the teaching of the prophets is that the nation is responsible for the welfare of the people, and must act as the protector of the poor and oppressed.

The Old Testament as History.—One of the most unique features of the Old Testament—and it is a feature which is not found in the same degree anywhere else—is its insistence upon the fact that history is teleological, and that throughout its course and movement God is working out an eternal purpose for the world in general, and for his

chosen people in particular. It is not too much to say that the Old Testament is the first great philosophy of history, and that no subsequent philosophy of history has ever superseded it. It is this characteristic that helps to give to the Old Testament its supreme value. The Old Testament is far more than a storehouse of historical facts; its greatness lies rather in the interpretation which it puts upon those facts, and its recognition of the presence of the 'unseen hand' of God behind all the events of history, shaping and moulding the destinies of nations.

When we come to consider the question as to the value of the narrative in the Old Testament, the record has, of course, to be tested by the recognised canons of historical research, and we must not be surprised if, as the result of the investigation, it is necessary to assign different degrees of validity to different parts of the story. The narrative of the history between 750 B.C. and 550 B.C. is quite the most reliable. For this period we have an abundance of contemporary documents, especially in the prophetic literature. We may be tolerably confident, too, about the general accuracy of the Davidic period, because, though the Books of Samuel in their present form are considerably later, they made use of sources which go back to a much earlier date. But when we work back into the remoter periods, there is more room for doubt. Our earliest narratives (J and E of the Pentateuch) are, on the most conservative calculation, at any rate 300 years later than Moses and more than 1000 years later than Abraham. There seems, however, good ground for supposing that the general picture of Moses is substantially true, because the later history of Israel cannot be explained apart from the facts which are recorded in the Book of Exodus. When we come to the patriarchal period, however, we are on ground that is much less sure, and there is the utmost diversity of opinion among modern scholars as to whether the patriarchs are to be regarded as real historical personages, or merely mythical figures representing certain early tribal movements. Two representative opinions may be quoted. Dr Skinner, in the *International Critical Commentary on Genesis*, writing of Abraham, says: 'Nothing forbids us to see in Abraham the first of that long series of prophets through whom God has communicated to mankind a saving knowledge of himself. . . . As we read the story, we may well trust the instinct which tells us that here we are face to face with a decisive act of the living God in history, and an act whose essential significance was never lost in Israelite tradition.' Dr Bennett, on the other hand, says: 'There is a marked contrast between the Moses and the Abraham narratives in the earlier documents. The latter do not seem to ascribe to Abraham national significance as an outstanding personality who moulded the political and religious future of his people. His adventures are rather those of the typical nomad or semi-nomad.' He concludes that the narratives of Genesis represent 'domestic folklore rather than reminiscences of an epoch-making prince and prophet.' One of the best discussions of the subject is to be found in Dr Bennett's article on 'The Historical Value of the Old Testament' in the volume of *London Theological Studies*.

THE NEW TESTAMENT.—*The Links between the two Testaments.*—Though the Old Testament was not definitely canonised in its present form till after the earliest New Testament documents had been written, yet there is a gap of about 200 years between the writing of the last book of the Old Testament and the first book of the New. These two centuries were not a period of silence. There was no cessation in God's dealings with his people,

no hiatus in the divine preparation for the advent of the Messiah. The Books of Maccabees relate the story of the heroic struggle for freedom which gave once more to Israel the sense of its nationality. As Westcott puts it, 'The Maccabees inspired a subject-people with independence; they found a few personal followers, and they left a nation.' *The Book of Wisdom*, written about the commencement of the Christian era, by its speculations with regard to Wisdom and the Logos as attributes of God, helped to provide the categories for the Christian interpretation of Christ. There can be no doubt, for instance, that the language which is used to describe Christ in the opening verses of the Epistle to the Hebrews was freely borrowed from it. *The Testaments of the Patriarchs* (109–107 B.C.), which contains a series of ethical tracts for the times, certainly influenced the thought of St Paul, and some resemblances have been pointed out between its teaching and that of Jesus. *The Book of Enoch*, which in its present form is a composite document, contains in the section known as 'the Similitudes' (which dates from the first half of the 1st century B.C.) a portrayal of the Messiah, whom it describes as 'the son of Man' 'seated at the right hand of the throne of God'—a conception which transcends the Messianic ideas which we find in the Old Testament. *The Assumption of Moses* (between 1 and 30 A.D.) anticipates the teaching of Jesus upon Quietism. Further Messianic ideas appear in the *Psalms of Solomon* (between 70 and 40 B.C.), the *Apocalypse of Baruch* (between 50 and 100 A.D.), the *Ascension of Isaiah* (80 and 100 A.D.), and the *fourth Book of Ezra* (after 70 A.D.), but in the case of the three latter books they may possibly (though this is not probable) have been suggested by Christian influences. It is impossible to give any real impression as to the vast effect which this intermediate literature produced upon the New Testament. The New Testament must inevitably have been a very different book if the writers had not been steeped in the teaching and spirit of these writings. And it is no exaggeration to say that New Testament study has been simply revolutionised in modern times by the discovery and publication of the Jewish apocalyptic writings. 'It is,' as Sanday and Headlam say in their *Commentary on Romans*, 'by a continuous and careful study of such works that any advance in the exegesis of the New Testament will be possible.' The publication of an annotated translation of this literature in the Oxford *Apocrypha and Pseudepigrapha* (1913) has now for the first time placed the available materials in the hands of students in a convenient form.

The Character of the New Testament.—The New Testament is the inspired literature of early Christianity. It consists of three different types of books: (a) The Historical Books—viz. the four Gospels and Acts—which give an account of the life and teaching of Jesus, and of the development of the primitive Church from its foundation in Jerusalem to the arrival of St Paul in the city of Rome; (b) the Epistles, which represent the correspondence of St Peter and St Paul and other leaders of the apostolic age with different churches or groups of Christians: it is in these epistles mainly that the doctrinal position of the Christian religion is developed; (c) Prophecy or Apocalyptic, represented by the Book of Revelation, which describes the Christian eschatology, and portrays the events which the Church believed would take place before and at the termination of human history by the return of Christ.

The whole of this literature, diverse as it is in form and outlook, is animated by one spirit and dominated by one theme. Christ is the centre and soul of every book. His teaching and his great

act of redemption, his person and the saving grace which he came to reveal, form the basis and foundation on which every utterance in the New Testament rests. There are different types of theology, different modes of expression, different interpretations of the Christian facts, but the acceptance of Jesus Christ as the Son of God and the Saviour of the world is the great assumption that lies behind every document in the New Testament.

The Origin of the New Testament Literature.—Jesus himself left no writing behind him. The correspondence with Abgarus, which later ages attributed to him, is universally recognised as a forgery. In the beginning of things, therefore, it was not the New Testament that created the Church: it was rather the Church that created the New Testament. Judged by ordinary standards, the New Testament came into existence in a haphazard way, though doubtless behind the causes that produced it there was always the working of the Spirit of God. We cannot be absolutely certain which was the earliest document to be written, but we know that it must have been an epistle. There are three claimants for the position—the Epistle of James, 1 Thessalonians, and Galatians. It was the needs and circumstances of early missionary work that led to the writing of the Epistles. The Christians of different churches needed to be encouraged; the problems and perplexities which beset both faith and practice in early times needed to be dealt with; erratic tendencies in thought and life needed to be corrected; the advice of the founder was often sought on matters of difficulty which inevitably arose in the development of new communities; controversies emerged in which it was necessary for an apostle to intervene. And it was to meet the needs of the situation in the churches, which had been created by their successful missionary labours, that St Paul and other leaders of the Apostolic Church first took to writing letters, generally to communities, but sometimes to individuals. These epistles were written in view of the problems and difficulties of the 1st century, and the writers had no idea that their letters would ever form part of a New Testament. If this thought had occurred to them, we may be sure that these letters would have assumed a very different form.

The Gospels were written to meet the needs of the second generation of Christians, and especially of those who lived in the Gentile world, far removed from authentic sources of information with regard to the facts of the life of Christ. Probably the earliest demand was for some authoritative statement of the teaching of Jesus for the use of new converts and others who had not themselves had an opportunity of listening to his own words or the benefit of instruction from the apostles. The first attempt to satisfy this demand is found in the document known as Q, which is now incorporated in the Gospels of St Matthew and St Luke. The earliest gospel—St Mark—was written for Gentile Christians, more particularly for those who lived in Rome. The first and third gospels were a compilation from these two sources, with additional material gleaned from elsewhere, St Matthew being written for Jewish, St Luke for Gentile, Christians. Finally, the explanation of the cause which produced the Book of Revelation is not difficult to find. The atmosphere during the latter part of the 1st century was full of apocalyptic ideas, many of which specially appealed to the Christian imagination. Men could not fail to ask, Is there not a place in Christianity for the apocalyptic hope? What has Christianity to say about eschatology? It was to answer such questions as these that a Christian writer in the reign of

Domitian appropriated the best apocalyptic material which he could find and suffused it with the Christian spirit.

It took a hundred years—that is, if we follow modern criticism and place 2 Peter about 150 A.D.—to create the literature of the New Testament, though it is only fair to add that by far the greatest part of it was produced between 50 and 100 A.D.

The Formation of the New Testament Canon.—

The canon of the New Testament is composed of books which were regarded as inspired by God to be the guide of men in matters of faith and life. We have seen how the literature arose. The question we have to consider now is, When did these books come to be regarded as Scripture and take rank side by side with the Old Testament? We can discuss the question best if we divide the history of the early Church into the following periods: (1) 70–135, (2) 135–170, (3) 170–210, (4) 210–400, and consider the treatment of the New Testament books in each. In the *first period* there is no suggestion of the formation of a New Testament. There are allusions to some of the epistles—to 1 Corinthians in Clement of Rome and to Philipians in Polycarp—and quotations are made from other epistles, but there is nothing to show that they were regarded as Scripture. In the *second period* some real progress is made. The Gospel of St Matthew is cited as Scripture (and this is the earliest application of the word to any of our New Testament books) in the so-called second Epistle of Clement, which is generally dated about 150. More striking testimony still is to be found in Justin Martyr (c. 150). In describing the worship of his time Justin says: 'On the day called Sunday all who live in cities or in the country gather together to one place, and the memoirs of the apostles or the writings of the prophets are read as long as time permits.' There can be no doubt as to the meaning of the term 'memoirs,' because Justin himself adds the explanation, 'the memoirs of the apostles which are called gospels.' Thus we see that in the time of Justin the gospels were used in public worship side by side with the prophets. In this period we find the first attempt to create a canon made by Marcion the Gnostic (c. 140). Marcion's canon consisted of the Gospel of St Luke (in an abbreviated form) and ten Epistles of St Paul, which he also mutilated to suit his own views. The *Diatessaron* of Tatian (c. 160), which is a harmony of the four gospels, is a further piece of evidence as to the place which the gospels had already won in the esteem of the Church. We may therefore say that in this period the canon began to shape itself as far as the gospels and the Pauline epistles are concerned. It is the *third period*, however (170–210), that is really creative. To this period belongs the Muratorian Fragment, which is the first formal Christian attempt to construct a New Testament canon. The Muratorian Fragment gives a list of the books which were in general use in the Christian Church, with a brief account of the origin and authorship of each. We have also the evidence of the three great Fathers who flourished at the end of the 2d and the beginning of the 3d century—Irenæus, Clement of Alexandria, and Tertullian—whose writings represent the recognised opinion of the time. From this evidence, as also from the evidence of the Old Latin and Syriac versions, we obtain incontestable proof that the bulk of the contents of our present New Testament was universally accepted as Scripture at this time—viz. the four Gospels and Acts, the thirteen Epistles of St Paul, 1 Peter, and 1 John. 'No one will deny,' says Westcott, 'that these books occupied the same position in the estimation of Christians in the time of Irenæus as they hold now.'

The remaining seven books of the New Testament—i.e. Hebrews, James, Jude, 2 John, 3 John, 2 Peter, and the Book of Revelation—are not so well authenticated. There is strong testimony in favour of most of them, but the testimony is not unanimous. James and Hebrews were recognised in the Eastern division of the Church, but do not seem to have been generally used in the Western, since they are found in Old Syriac but not in the Old Latin versions. Moreover, they are absent from the Muratorian Fragment. 2 John, 3 John, and Jude, on the other hand, seem to have been recognised in the West, since they are included in the Latin versions and the Muratorian Fragment, but not in the Syriac versions: the Apocalypse is partially recognised in both divisions of Christendom, but some doubt is thrown upon the Johannine authorship. There is as yet no trace of the use of 2 Peter at all. So that in this period we have really two canons, an *Eastern*, containing the four Gospels and Acts, thirteen Epistles of Paul, 1 Peter, 1 John, Hebrews, and James, and possibly the Apocalypse; and a *Western*, containing the four Gospels and Acts, thirteen Epistles of Paul, 1 Peter, 1 John, 2 John, 3 John, Jude, and possibly the Apocalypse. In the *fourth period* these two rival canons gradually began to coalesce, though it was some time before absolute unanimity was reached. Origen, writing about 250, regards 2 Peter, 2 John, 3 John, and probably James and Jude, as 'doubtful books,' and even in the time of Eusebius (325) the doubt still remained. There was a good deal of hesitation, too, about the Apocalypse. Athanasius and Epiphanius were the earliest Fathers to recognise a New Testament identical with our own. The other Fathers of the 4th century generally omitted the Apocalypse. It was not till the end of the 4th century that, under the influence of Augustine and Jerome, official sanction was given to our present New Testament canon at the Synods of Hippo (393) and Carthage (397). But even the decision of these councils did not altogether dispel the doubt about the Apocalypse, and it was not till some centuries later that it obtained an unchallenged place in the New Testament canon.

Other Books which were at one time regarded as Scripture.—In addition to the books which now form the New Testament, there were others which were for some time on the borderland, and which many people thought ought to have been admitted to the canon. The *First Epistle of Clement*, for instance, was publicly read in church right up to the time of Eusebius. The *Didache*, or Teaching of the Apostles, is quoted by Clement of Alexandria as Scripture, and mentioned by Athanasius in his list of 'sacred writings.' The *Epistle of Barnabas* is actually included in one of the earliest and most valuable MSS. of the New Testament—the Sinaitic—where it follows immediately after the Book of Revelation. Origen, too, describes it as a 'catholic epistle,' and cites it as Scripture. The *Shepherd of Hermas* seems to have been more popular still. It is included not only in the Sinaitic MS. of the New Testament, but in several other MSS. as well. Irenæus quoted it as Scripture, Origen regarded it as 'divinely inspired,' and Eusebius tells us it used to be read in public worship. On the whole, however, we are bound to admit that the Church has not suffered greatly by the omission of these books from the canon. They are all of them interesting and valuable as literature, but they have none of them the same spiritual value or the authentic note of revelation which characterises the recognised books of the New Testament.

The Language of the New Testament.—The New Testament was originally written in Greek. The particular type of Greek employed has, however,

been for centuries a puzzle to scholars, and it is only quite recently that its explanation has been found. It differs so profoundly not only from classical Greek, but from the ordinary literary Greek of its own age, that no satisfactory account could be given of it till the discovery of the papyri revealed the fact that it represented the vernacular speech of the day. The New Testament is written in the common tongue of the people—the language of the market-place and of the home. As Von Soden has said, 'The Christians did not create, as was once thought, a peculiar dialect of their own. Nor did they speak and write, as others have believed, in a Jewish-Greek patois. There is a difference between New Testament Greek and that of other contemporary writers. But this distinction does not lie in distinction of dialect. The latter authors, who wrote for a cultured public, endeavoured to imitate that epoch of the language which had been consecrated by the classic creations of the Periclean age. The Christian writers, free from all such æsthetic humours, spoke in the living language of their time, in that popular language of conversation and commerce as it again lives before our eyes in the epistles and commercial records which the sands of Egypt have preserved for the enterprising excavator of to-day.' But even within the New Testament itself there are varieties of style. The best Greek is found in the Epistle to the Hebrews and in the writings of St Luke. In point of style these books are not inferior to the contemporary literature of the time. St Paul, too, is a great master of the Greek tongue. 'The Greek of those days becomes in his hands the keenest and most flexible instrument of a spirit of boundless power and endowment.' The smallest amount of linguistic skill is found in the Johannine writings, more particularly in the Book of Revelation.

The Text of the New Testament.—The problem of textual criticism is to get back to the actual words of the original autographs of the New Testament books. Our earliest Greek MS. dates from the middle of the 4th century—some three hundred years after the earliest document was written—and the received text was based on MSS. of a much later date. It is inevitable that in the process of copying and recopying some corruptions must have got into the text. Moreover, when we come to collate the different MSS. we become conscious at once of an infinite number of variant readings. How can we determine, when our authorities differ, what was the original reading of the autograph? In the first place, it is necessary to examine and classify our material. This material, fortunately, is superabundant. (1) We possess more than 3000 Greek MSS. of the New Testament. They are divided into two classes. Firstly, we have a small group of uncials, so called because they are written in capital letters without any break between the words. The earliest and most valuable of these are (a) the Codex Sinaiticus at Petrograd (4th century, commonly known as $\aleph$); (b) the Codex Vaticanus at Rome (4th century, known as B); (c) the Codex Alexandrinus in the British Museum (5th century, known as A); (d) the Codex Bezae at Cambridge (6th century, known as D). Secondly, we have a large mass of cursives, so called because they are written in a smooth, running hand. These are of considerably later date, and therefore of much less value. (2) Besides the actual MSS., we possess a large number of quotations in early Christian writers—e.g. Irenæus, Tertullian, Cyprian, Origen—from which we are able to discover the particular form of text which was used in their time. (3) We have also the versions or translations of the New Testament into Latin, Syriac, Coptic, some of which were made at a very early

date, and are much earlier than our most ancient Greek MS.

It is by the scientific examination of these data that we are able to get back behind our earliest MSS. and reconstruct the text which was used in the 2d and 3d centuries. As a result of this process of investigation we find that four types of text are represented in our Greek MSS. and versions. (1) A Syriac text, which is the latest of the four, and does not seem to have been current till the 5th century. This form has been preserved in what is known as the *textus receptus*. It is the text which is found in the mass of later MSS. (2) The Alexandrian text, which is represented, partially at any rate, by Codex A and the quotations in Origen. (3) The Neutral text, which has the support of Codices κ and B and the Bohairic version. (4) The Western text, which is found in Codex D, the Old Latin, and the Old Syriac versions. The modern alternative lies between the two last types. Westcott and Hort in their epoch-making reconstruction of the New Testament text followed almost entirely the Neutral type. They attached supreme importance to the evidence of Codices κ and B, and maintained that when these two MSS. are in agreement their testimony outweighs in value all other evidence. The recent trend of textual criticism, however, is towards the rehabilitation of the Western text, and much more importance now is attached to the evidence of the Old Latin and Old Syriac versions than was formerly the case.

The Versions of the New Testament.—The New Testament was translated at a very early date—not later than the 2d century—into Latin for the North African Christians and into Syriac for the Christians of the East. Many of the Old Latin MSS. still survive, and are of great use to scholars in textual criticism. At the beginning of the 5th century a revised Latin version was constructed by Jerome, known as the Vulgate, and this is still the authorised version in use among Roman Catholics. Several MSS. of the Old Syriac version are in existence—one a very interesting palimpsest of the gospels discovered by Mrs Lewis in the monastery of St Catherine on Mount Sinai in 1892, and now generally known as the Sinaitic Syriac. The Peshitta is a later revision—like the Vulgate in Latin—made from existing Old Syriac versions and current Greek MSS. in the time of Rabbula, who was bishop of Edessa from 411 to 435. The New Testament was also translated into Coptic for the use of native Egyptian Christians. Two forms of this version remain, known as the Bohairic and the Sahidic respectively. It was largely due to the influence of these versions that Christianity became a permanent institution in Egypt in the shape of the Coptic Church. It is a striking fact that nothing remains of the splendid North African Church which, under the leadership of Cyprian and Augustine, won such renown and exercised such a mighty influence in the early centuries. Not a trace is to be found of any remnant of primitive Christianity in Algiers or Tripoli, while in Egypt the Coptic Church still survives as a relic of ancient Egyptian Christianity. The explanation is that the New Testament was translated into the native dialects of Egypt, but not into the tongue of the Berbers. The survival of the Coptic Church in Egypt, and the absence of any similar institution in the other regions of North Africa, is a valuable testimony to the power and influence of these translations of the New Testament. The Gothic version of the New Testament was made by Bishop Ulfilas in the 4th century, and the Armenian in the beginning of the 5th. The date of the Ethiopic version is not so clear, but it was probably made somewhere about

the year 500. Thus we see that within five hundred years the New Testament was translated into every language of importance in the civilised world.

Modern Criticism and the New Testament.—The specific treatment of the history of modern New Testament criticism will be found in the article on Biblical Criticism (see also GOSPELS), but there are some points which cannot be passed over here. We need not refer to the attack of Strauss upon the miraculous elements in the gospel, or the Tübingen theory of the origin and development of the literature of the New Testament. Both these forms of attack are out of date to-day. Modern scholarship is interested mainly in three problems: (1) the essential element in the teaching of Jesus; (2) the historical value of the gospel narrative; (3) the value of the theology of the epistles. Of course there are innumerable other questions in debate, but these are mostly concerned with the date and authorship of the different books. The general trend of opinion among scholars, for instance, is to deny the Johannine authorship of the Fourth Gospel, without disputing the fact that it owes much to his teaching and influence. The authorship of the Pastoral Epistles is still a matter of question, though the majority of modern authorities think that the difficulties in the way of accepting the Pauline authorship are insuperable. But such problems as these have now assumed a secondary interest in view of the larger and more vital issues that have been raised.

The Essential Point in the Teaching of Jesus.—Roughly speaking, there are two schools of thought: (1) the ethical; (2) the apocalyptic. (1) The ethical school—which perhaps finds its best expression in Harnack's *What is Christianity?*—maintains that Jesus was essentially a moral and religious teacher. His mission was to give the world a new ideal of God and man and duty. The Sermon on the Mount constitutes the heart and core of his revelation. The apocalyptic elements in his teaching are of secondary importance, and may be ignored. (2) The apocalyptic school, on the other hand, goes to the opposite extreme. It lays all the stress on those elements in the teaching of Jesus which speak of his speedy return to found the kingdom of God. The ablest exponents of this view are Johannes Weiss and Schweitzer, whose book, *The Quest for the Historical Jesus*, is quite revolutionary in its interpretation of the teaching of Jesus. According to the views of Weiss and Schweitzer, the ethical elements in the gospels are of secondary importance. Jesus never intended to draw up an absolute ethic, but only to lay down for his followers an 'interim-ethic,' which was to be valid only to the Parousia. The apocalyptic school have, undoubtedly, rendered great service by calling attention to a neglected element in the teaching of Jesus, but they have gone to too great an extreme in assuming that this aspect dominated the whole of his outlook. Jesus cannot be reduced to a mere ethical teacher, but, on the other hand, he cannot be regarded as a mere apocalypticist. Both aspects are obviously present in the gospels, and both must be included in any interpretation of the teaching of Jesus which has any real claims to be regarded as adequate.

The Historical Value of the Gospels.—Within recent years the historicity of the gospel narrative has been severely attacked by an extreme school of German critics headed by Drews and Kalthoff, who have tried to maintain that the gospel story is a pure romance, and that no such person as Jesus ever existed. 'The figure of Jesus,' they urge, 'is a creation of the imagination, and is derived chiefly from the atmosphere of the age.' Such a theory represents a mere delirium of criticism, for (1) it is inconceivable to suppose that

the portrait of Jesus in the gospels is the fortuitous concurrence of the atoms of theology and philosophy that happened to be in existence at the time. Points of affinity and resemblance, of course, there are bound to be between elements in the teaching of Jesus and elements in the religious life and thought of the age, but there is nothing to suggest that the picture of Jesus as a whole could have been evolved out of the *Zeitgeist*. (2) Our evidence for the reality of Jesus is stronger than is usually the case when we are dealing with historical personages in ancient history. It is stronger, for instance, than the evidence for Plato, and much stronger than the evidence for Apollonius of Tyana, though both these men are taken for granted by the critics who challenge the truth of the gospel narrative. (3) Even if we ignore the gospels, the evidence for Jesus in the epistles and in the history of early Christianity is simply overwhelming. But though we may dismiss this view as altogether chimerical, it does not follow that we are entitled to go to the opposite extreme and accept every statement in the gospels as historical fact without further examination. We must apply to the gospel narrative the ordinary canons of historical research. We must weigh and test the gospel narrative in the scales which the ordinary historian uses in order that we may discover its validity. We must carefully compare the documents, and arrange them in chronological order, and distinguish between the different strata of evidence. We must make allowance for the personal equation of the historian, and the influence of the time-spirit upon him. We must remember, for instance, that the Fourth Gospel is much later than the other three, and therefore likely to be less reliable, and that those parts of the Synoptics which embody more ancient sources take us back nearer to the events than the other elements, which are probably the writer's own contribution to the subject. We must remember, too, that the Fourth Gospel is obviously written with an apologetic purpose 'to prove that Jesus is the Christ, the son of God,' and that this purpose must have inevitably coloured the writer's treatment of his material. The whole investigation is very intricate and complex, and has not so far been carried through to its final issue. But we need have no hesitation in affirming that when this examination has been scientifically made, it will only serve to prove that the picture of Jesus in the gospels is substantially true.

The Value of the Theology of the Epistles.—Another point which is being challenged to-day is the validity of the theological statements of the epistles. Does the theology of St Paul, for instance, hold good for modern thought? One of the most remarkable advances in New Testament study in recent times is the use and application of what is known as 'the historico-critical method.' The historico-critical method lays down as its fundamental principle the proposition that we are bound to take into consideration the influence of the atmosphere of the time in estimating the value of the statements which we find in the New Testament books. We know, for instance, that St Paul was a Pharisee before he became a Christian. The mind which he brought to the examination of the Christian facts could not, therefore, have been a *tabula rasa*, but must necessarily have been stored and furnished with Jewish preconceptions and ideas. The doctrines of predestination, original sin, atonement, the resurrection of the body, have all their counterparts in current Jewish theology. Even the very categories which the apostle uses in his interpretation of Christ were in many cases borrowed from Jewish thought. We must remember, too, that Paul wrote for the 1st century, and that his object was to deal with the particular

problems and questions of the hour (if he had been writing to-day his statements would have assumed a very different form). Why should the 20th century be in bondage to 1st-century ideas? Would it not be an advantage if the Church were to free itself from the tyranny of Pauline thought? These arguments are sound enough when they are not carried to too great lengths. It is clear that we have to use the principles of the historico-critical method and make allowance for 1st-century influences and ideas upon the mind of Paul. There are obviously some things in the epistles that are merely of local and temporary interest. But when we are told that it is necessary to abandon Paulinism as a whole and rid ourselves of its influence, it is clear that the theory has overreached itself. Paulinism could not have exercised such a permanent and abiding influence on the Church if it had been merely the product of 1st-century ideas. The task of modern scholarship is to distinguish between the transitory and the permanent elements in Paulinism, to sift out the chaff of 1st-century ideas that the pure wheat of eternal truth may be made manifest. In order to do this satisfactorily we must find some scientific criteria, and fortunately there are certain criteria which enable us to fulfil the task with precision and conviction. We have to ask four questions. (1) What elements in the epistles are in accord with the teaching of Jesus? Agreement with the teaching of Jesus is sufficient to establish the validity of any doctrine. (2) What elements have been derived from personal religious experience? It is clear that truths which are the outcome of personal experience are more valid than statements which merely reproduce the current conceptions of the age. We must be on our guard, however. A religious experience is one thing, the interpretation of that experience something very different. In order to guard ourselves we are bound, therefore, to ask a third question. (3) How far have these truths been vindicated in general Christian experience? A truth is not merely true for one: it is true for all. In as far as the main ideas of Paulinism are valid, they will form an element in the universal experience of the Church. Then there is a fourth criterion which is very valuable for the purposes of testing values. (4) What elements in the theology of the epistles have been found to work in history? Christianity has been in existence for nearly two thousand years. The various phases and aspects of its teaching have been tested time after time. If the epistles of St Paul had been a mere *farrago* of 1st-century ideas, they would have gone out of date long ago. One of the strongest arguments for the permanent validity of the main elements in the Pauline theology is the undeniable truth of the assertion of Harnack, 'Whenever Paulinism has entered into history it has always created a ferment.' Paulinism has 'worked' throughout the centuries, and it is this fact that justifies its claim upon us to-day. Paulinism, after all, in its essential features is the transcript of a great religious experience, an experience that has become classic in its importance and value.

The Eternal Value of the New Testament.—The value of the New Testament lies not so much in its history, or even in its theology, as in the appeal which it makes to the heart and conscience of mankind. What Robertson Smith has said about the Bible as a whole especially applies to the New Testament. 'If I am asked why I receive Scripture as the word of God and as the only perfect rule of faith and life, I answer with all the Fathers of the Protestant Church, Because the Bible is the only record of the redeeming love of God; because in the Bible alone I find God drawing near to man in Christ Jesus, and declaring to us in him his

will for our salvation. And this record I know to be true by the witness of his spirit in my heart, whereby I am assured that none other than God himself is able to speak such words to my soul.' Criticism may alter our views about the authorship and dates of the different books, it may raise questions about this particular statement or that, it may analyse the influences which have shaped and coloured the human record, but it cannot touch what after all is the very centre and soul of the New Testament, the revelation of the grace of God in the Incarnation and redeeming work of Jesus Christ. The words of Coleridge will always be true, 'The Bible finds us at greater depths of our being than any other book.' We have long since abandoned the verbal theory of inspiration. We no longer think of the Bible as having been 'divinely ventriloquised through human masks.' We are bound to recognise to the full the free play of human activity in the composition of the different books. The authors were not mere automata of the spirit. Their personalities were never overridden by the influx of the divine afflatus. But the Bible could never have been the book it is, it could never have possessed its universal appeal, it could never have left such an impress upon the history of the world, unless its writers had in a unique degree been imbued with the divine spirit and inspired by God. We may not to-day make a theory of inspiration our starting-point, but some doctrine of inspiration is the goal to which our study of the Bible inevitably leads us. The supremacy of the Bible over all other forms of literature is so remarkable that some explanation is needed to account for it. And the measure of the difference between the Bible and other books is the measure of its inspiration. In other words, though we cannot say to-day 'The Bible is inspired, and therefore it is supreme among books,' we do say, and are bound to say, 'Because the Bible is supreme among books it must be inspired.'

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Apocrypha.	Hebrew Language.	Rationalism.
Apologetics.	Inspiration.	Revelation.
Biblical Criticism.	Masorah.	Samaritan Pentateuch.
Book.	Miracle.	Septuagint.
Exegesis.	Palæography.	Targum.
Gospels.	Pentateuch.	Vulgate.

Bible, TRANSLATIONS OF THE. Some account of the older translations will be found in the article BIBLE (sections headed *The Language and Text of the Old Testament*, and *The Versions of the New Testament*). See also BIBLICAL CRITICISM, SEPTUAGINT, TARGUM, VULGATE. In modern times versions have appeared in almost all spoken languages.

English Translations.—Partial translations and paraphrases into Old English are still extant. The first complete version in English was that of Wyclif about 1382, from the Vulgate. Of this, however, the gospels alone can be certainly identified as the work of Wyclif himself, and this portion was done as early as 1360. The Old Testament and apocryphal books were translated principally by Nicolas de Hereford. A later complete version of it was finished by Wyclif's friend, John Purvey, about 1388. The Scottish New Testament, printed by the Scottish Text Society, was adapted from Purvey for the use of Lollards by Kyle. Printing was introduced into England by Caxton in 1477, and translations and summaries of parts of Scripture appeared in various works from his press. The New Testament of William Tyndale was issued at Worms (1525); later editions, 1534–35. Tyndale also translated the Pentateuch, and some other parts of the Bible. The first complete printed English Bible was that of Miles Coverdale (1535). Coverdale's Bible is based upon the Swiss-German version (Zurich, 1524–29), with the use of Luther, the Vulgate, and Tyndale. Matthew's Bible (1537) is composite: the New Testament is Tyndale's 1535; the Pentateuch is also Tyndale; while of the rest, part is Coverdale, and part probably from Tyndale's MSS. The so-called Great Bible, a revision of Matthew's, was undertaken under the auspices of Cromwell, Earl of Essex; the printing, being interrupted in Paris, was completed in London (1539). In 1557 the English exiles who had found refuge in Geneva during the reign of Mary produced a version of the New Testament, with preface by Calvin, and in 1560 the whole Bible. This is known as the Geneva Bible, sometimes popularly as the 'Breeches Bible,' from the rendering, Gen. iii. 7. The

version was provided with racy notes, which made it a favourite with the common people (1st Eng. ed. 1576). Meantime a new version had been in preparation under the influence of Archbishop Parker. Separate portions were allotted to different scholars, chiefly of the Episcopal Church, and the whole was then revised by Parker and other learned divines. This version (1568) goes by the name of the Bishops' Bible, vulgarly the 'Treacle Bible,' from the rendering of Jer. viii. 22, 'Is there no tryacle in Giliad?' In 1582 a New Testament was issued by the English Catholic College at Rheims, and the Old Testament in 1609 at Douai. In 1604 James appointed a conference at Hampton Court for determining of things said to be 'amiss in the church.' The suggestion of a new translation, made by Rainolds, was taken up by the king, and six committees were appointed to execute the work. Two of these sat at Westminster, two at Cambridge, and two at Oxford, their work being revised by a general committee. The version appeared in 1611. The 'Revised Version' was due to the suggestion of the Convocation of Canterbury. Two companies of translators were appointed, one for the Old Testament, and the other for the New. They began to sit at Westminster in 1870; the New Testament was issued in 1881, the Old in 1885, and the Apocrypha in 1895. After the work had been begun, a number of American scholars were added, and all points of ultimate difference of opinion between the English and American revisers were appended to the versions issued. The 'Westminster Version of the Sacred Scriptures' with notes began to appear in 1913 under the general editorship of Fathers Lattey and Keating. The monopoly of printing the authorised version of the Bible belongs to the crown, by whom it is granted to certain patentees. See BOOK-TRADE.

German and other Translations.—Early in the middle ages translations of portions of the Bible were rendered into many of the western languages, but these were mostly explanatory paraphrases or versions of the Bible narratives in metre rather than translations proper. Otfrid's *Krist* is a rhymed harmony of the gospels in High German, and the *Heliand* in Low German alliterative verse. The Abbot of St Gall's version of the Psalms (980) and the gospel harmony of 'Tatian,' from the Latin of Victor of Capua, follow next; and to these succeed numerous German versions of the histories and other books. Complete German versions from the Vulgate existed as early as the first half of the 14th century. It is claimed that there were seventeen or eighteen such versions prior to Luther's, and of these five were previous to 1477. Already in the end of the 12th century Provençal translations were in the hands of the Albigenses, and the demand for the Bible in the vulgar tongue spread widely in spite of the prohibition of the Church. In Spain, Alfonso X. of Castile is said to have caused the Old Testament to be translated. Another version was certainly made during the 15th century. The history of the earliest versions in Polish, Italian, and Hungarian is hopelessly obscure. Printing gave an enormous impetus to the translation and production of the Scriptures. A Spanish version by Borrell was published at Valencia in 1478, an Italian by the Benedictine Malherbi at Venice in 1471, a French at Paris in 1487, a Bohemian at Prague in 1488, and a Dutch as early as 1477. Luther's translation of the whole Bible was finished in 1534, but the New Testament had been issued as early as 1522. It was by no means, as has been seen, the earliest translation into a German tongue, but it was the first that reached the whole people, and it marked an epoch in the history of High German corresponding to that made in English by the authorised version of 1611. It

was quickly translated into Platt-Deutsch, Danish, Swedish, Dutch, and Icelandic. A revision was commenced in 1863, and not completed till 1882. The Bible of Holland is that authorised by the Synod of Dort in 1637; of Sweden, the official version, prepared by a company of scholars since 1774. The Danish is the work of Resenius (1607), revised by Svaning (1647); the Swiss, an entirely new version prepared in 1772 by Hottinger and others, on the basis of the 1665 version. French versions were made by Lefèvre d'Étaples (Faber Stapulensis) in 1523-28, and Olivetan, a cousin of Calvin's (1535-45). The latter as revised by Calvin in 1551, and later by Beza, became the official text of the French Reformed Church. The translations of Osterwald of 1714 and 1744 are also popular in spite of their conspicuous errors. Another edition still is in use, that prepared in 1588 by the *Vénérable Compagnie* under the direction of Bertram, on the basis of Calvin's, which was subjected to some revision in 1805 and again in 1835. There are many versions of the Old and New Testaments by individual scholars, such as the Latin Testament of Beza, but these belong rather to the history of exegesis. Translations of the Bible have now been made into almost all the languages of the world. See further articles on the various languages; also BIBLE SOCIETY, CYRIL.

Bible Christians. See METHODISTS.

Bible Communists. See PERFECTIONISTS.

Bible Society, an association having for its object the diffusion of the sacred Scriptures. One was founded in 1710 at Halle. An association was formed in England in 1780 for the distribution of Bibles among soldiers and sailors, and afterwards took the name of the Naval and Military Bible Society.—The British and Foreign Bible Society, the parent of a multitude of similar institutions, was established in 1804. It was able to expend only £691 in the first year of its existence, but its annual income gradually increased. Auxiliary and branch societies and dependent associations rapidly sprang up in all parts of Britain and in the colonies. It has printed and distributed over 500 translations of the Bible—in many cases complete, in others only the New Testament, in some only particular books; and it issues annually above four million copies of the Bible or parts of it.—The Edinburgh Bible Society was from 1826 an entirely separate society, till 1861, when the leading Scottish societies amalgamated to form the National Bible Society of Scotland.—The American Bible Society was founded at New York in 1816, and issues annually about 1,500,000 copies.—Of the numerous Bible Societies of Germany, the most important is the Prussian Central Bible Society in Berlin, founded in 1814. See the *History of the British and Foreign Bible Society* by William Canton (4 vols.), the shorter *Story* by the same author (1904), and the *Centennial History of the American Bible Society*, by H. O. Dwight (1918).

Biblia Pauperum ('Bible of the Poor') was a sort of picture-book of the middle ages, giving, on from thirty-four to fifty leaves, the leading events of the Old and New Testaments, each picture being accompanied by an illustrative text or sentence in Latin. Each picture with its text was at first engraved on one wood block. But early in the 16th century the method fell gradually into disuse, and was superseded by ordinary printing from types. See BOOK, PRINTING, WOOD-ENGRAVING.

Biblical Criticism. The term Biblical criticism might properly embrace all types of criticism as applied to Scripture. In practice, however, it does not include literary criticism in the sense of æsthetic valuation of the Bible as literature. Literary criticism is indeed the element most prominent

in it, but as equivalent to what is commonly known as higher criticism. But the term ought not to be restricted to this, since it includes lower criticism and historical criticism. Our first duty, then, is to discriminate between these different departments of our province. This cannot be effected with precision, for the boundaries fluctuate, and several problems belong to more than one department. Nor, while we separate the spheres of investigation for practical convenience, should we ever forget that the results in one often affect the conclusions reached in another. Textual, or, as it is also called, formal or lower, criticism seeks to restore, so far as possible, the document under investigation to the form in which it left the author's hand. When this has been done we pass on to the investigation of such problems as the date, the authorship, and the detection and reconstruction of the sources employed in its composition. This is the province of higher or material criticism. It is called higher to distinguish it from the lower criticism. In view of widespread misapprehension it may be explained that the epithet implies no claim to superiority, nor yet is it specialised to designate novel and revolutionary as opposed to traditional views. Nor, again, does the term lower criticism imply any agreement on problems of authorship and structure with the views commonly entertained. The distinction is one of subject matter, and not of results. The scholar who seeks to solve the problem of authorship by scientific scholarship employed with scientific method is practising higher criticism as much when he reaches a conservative as when he reaches a negative conclusion. When the text of the document has been fixed and its literary history has been traced, we pass from lower and higher to historical criticism. Here we have to test first the qualifications of the author for writing a truthful narrative, and then we can advance to the scrutiny of the narrative itself. It may be added that some authorities use the term higher criticism to cover what is best kept under the heading of historical criticism.

This rough delimitation will become more precise as we proceed to the exposition of method and results. But before this is undertaken, it may be well to give a fuller application to the caution already given against undue isolation. Just as the investigation of one province of criticism inevitably reacts on that of the others, so Biblical criticism must constantly take into account other branches of Biblical science, notably exegesis and theology. The true interpretation of the text may often have a decisive voice in determining which of two variant readings is to be accepted, while a false interpretation may easily vitiate a critical conclusion based on the evidence of the passage. And, conversely, an interpretation of a passage, possible in itself, may be excluded by the impossibility that the author should have meant it, or by the fact that at the date to which criticism assigns it, it would have been an anachronism. Similarly with Biblical theology. That Paul cannot have written the Epistle to the Hebrews, though abundantly demonstrated by other lines of argument, could be inferred with certainty from a comparison of its theology with Paulinism. Nevertheless, while the student must never forget the solidarity of all the different provinces of his subject, he should seek, as far as possible, to investigate each by its own methods and within its own limits, without calling in aid from its neighbours.

Textual criticism has a very restricted sphere of operation in modern literature. But before the invention of printing every copy had to be written out independently, and the chances of scribal error were naturally increased with every fresh copy, since the scribe was likely to reproduce all the errors of his copy and add new ones of his own.

Accordingly in any ancient work, since we are dependent on manuscript copies, most of them removed from the autographs by many stages of transcription, textual criticism has an important part to play. This is specially the case with literature that has passed through the hands of so many scribes as the Scriptures. There is, however, a notable difference between the Old and the New Testament. The Hebrew Bible has been transmitted to us in a standard text from which the manuscripts present very little substantial divergence. On the other hand, the manuscripts of the Greek New Testament differ very widely from each other, and the number of various readings is enormous. It would be a mistake to infer that the text of the Old Testament has been better preserved than that of the New. The absence of variants is no cause for congratulation; it is a misfortune to be deplored. For it is not due to the minute accuracy with which the text has been copied. The elaborate precautions taken against copyists' errors do not date back beyond the Christian era. And that our present Hebrew text is corrupt is clear from many indications. At times it cannot be translated without grammatical violence; in other cases the versions, and notably the Septuagint, have preserved a different and obviously a better text; in some cases we have two versions of the same matter with variants, due plainly to textual corruption; and finally, even where none of these grounds for suspicion are present, close examination may suggest the presence of textual error, which can be easily cured by a slight conjectural emendation. The absence of Hebrew variants of moment can only mean that a standard text was formed and manuscripts differing from it were suppressed. Hence were it not for the versions we should be left for the most part without variant readings. In the New Testament, on the contrary, the immense number of variants gives the critic abundant material on which to work, and confidence that the original reading is very rarely likely to have been entirely lost. It is his object to reconstruct a text corresponding as nearly as possible to the autograph. The process may be best seen by reference to the New Testament. Here it is necessary to leave the examination of individual passages until some valuation of the manuscripts and versions has been accomplished and the general history of the textual tradition has been traced. The manuscripts may be examined one by one to determine whether on a broad view they seem to preserve a good text—that is, whether, in the case of variants, they generally approve themselves as preserving readings marked by intrinsic excellence. This involves, of course, some preliminary judgment on many individual passages. But where it is carried through, in a large number of instances a fairly reliable opinion may be reached on the general character of the manuscript. Since, however, an examination of the textual apparatus quickly shows that manuscripts tend to fall into groups, the method applied to the individual manuscript may be extended to groups of manuscripts. Judgments of this sort, however, depend on the impression formed by the critic as to what is a good reading, and there is accordingly an element of subjectivity in it. The genealogical method has a more objective character. It is possible to construct a genealogical tree, which shall exhibit the relations of the manuscripts, separate the different lines of transmission, determine which types of text are old, which more recent and due to revision, and from readings shared by manuscripts on different lines of descent reconstruct the text of the common ancestor. We may thus reach a more objective valuation of manuscripts and groups of manuscripts. In many cases the true reading may be at once decided by reference to the authorities by which it is supported. What

applies to manuscripts applies also to versions and quotations, the necessary allowances being made, and due precautions being taken. Yet internal evidence must not be lost sight of, and in a multitude of instances it must give the decisive vote. The causes of corruption must be carefully studied. Some errors arise from defective hearing where the scribe writes from dictation, especially if there is defect in pronunciation or the pen cannot keep pace with the utterance. Others are due to misreading or to the occurrence of the same word twice, the scribe writing to one and resuming at the other, and thus either writing a passage twice over (dittography) or omitting the intervening words. Or abbreviations may be misinterpreted. Wandering thoughts may introduce something quite irrelevant, or the influence of similar passages may lead to assimilation. What is doctrinally objectionable may be modified or suppressed. Annotations on the margin may by the next copyist be woven into the text. Passages accidentally omitted may, when the mistake is discovered, be written in the margin and then introduced into the text at the wrong place. Possibly they may be written between two columns and then introduced into the wrong one. Or again, the writing may be blurred, the ink have faded, or the surface been rubbed, and illegibilities thus created mistakenly corrected. The critic must be on the watch for the operation of these and other causes. And there are certain principles by which we must be guided. That reading is most likely to be right by the assumption of whose originality the other variants can be best explained. The more difficult reading is generally to be preferred, the tendency of scribes being to simplify their text rather than to make it more obscure. Generally the scribe does not improve the text; he frequently makes it smoother and superficially more plausible, but on reflection his text is found to be thinner and less satisfactory. It is not possible in our space to follow the history of textual criticism, and the present position has been explained in the article BIBLE.

When the text has been settled, the student of a document has to inquire into its age, authorship, and literary history. These questions fall within the province of the higher criticism. He will search for allusions which will fix the date of the work in its present form, or at least a date before which it cannot have been written. The date after which it cannot have been written may also be determined either by internal phenomena, inconsistent with later origin, or by information as to its existence or evidence of its influence. These limits may often be fairly wide, but it may be possible by minuter and more extended study to make them much narrower. Authorship may sometimes be settled by the direct affirmation of the work itself, which is to be accepted, unless there is cogent reason to the contrary; or it may be settled by trustworthy tradition. Often these independent lines of evidence will afford mutual corroboration. In many cases, however, neither is available, and we have to recognise anonymity even where the date can be determined with some precision. But criticism is not then at the end of its task, as it would commonly be in the case of a modern work. For many documents have come down to us from antiquity which are composite in structure. They are not the creation of a single author bearing throughout the stamp of a single mind, but they have been formed by the combination of two or more documents. The critic must accordingly now examine his text to see whether it exhibits signs of composite authorship. These may lie on the surface in discrepancies, inconsistencies in standpoint, glaring divergences in style and vocabulary, or they may be brought to light only by more prolonged

and minute investigations. Something will depend on the skill with which the editor has blended his sources, eliminated inconsistencies, and contrived to impart an appearance of unity to the whole. When the critic is satisfied that sources have been incorporated, his next task is to disentangle these and determine their age. This task may conceivably prove impossible; but the fact that analysis is impracticable constitutes no valid disproof that the document is composite. Generally, however, analysis may be accomplished, though naturally with varying success. Scrutiny may disclose the presence of doublets—that is, double versions of the same event. If there are a number of these they may be examined for characteristic features. These features may be found in a whole series of stories, which may then be plausibly assigned to the same author, if other features do not forbid this. On this basis it is possible to extend the investigation to other portions, and thus gradually to sort out the homogeneous sections. The correctness of the analysis may be tested by the internal consistency of the sources thus reconstructed, by the possession of a common vocabulary, style, and point of view. Nevertheless, the analysis may have been correctly effected, and yet internal inconsistencies remain. This may be compatible with unity of authorship, since writers do sometimes contradict themselves; but it may be an indication that the analysis has not gone deep enough, and that strata exist within the source challenging the critic to a still keener analysis. Yet the warning is by no means unnecessary that criticism may easily pass into hypercriticism, that the microscope may be trusted too much, and minute points may be unduly pressed. But the scorn often heaped upon the finer analysis is not wholly justified. On this subject the writer may perhaps quote what he has said elsewhere. 'On the one hand, the excesses of analysis should not be used to discredit the analytic method altogether; and the critics constantly point out that their attempts at minuter discrimination of sources are quite tentative, and that an element of uncertainty must necessarily hang over them. On the other hand, it is clear that growing familiarity with the documents may sharpen the sense of the investigator for finer and finer analysis. The clues which he follows to unravel his tangled skein seem altogether too intangible to people whose fingers are all thumbs' (*The Bible: its Origin, its Significance, and its Abiding Worth*, pp. 167, 168).

The disentanglement of sources, the determination of their limits, the fixing of their dates, are important rather as means to an end than as the end itself. Biblical history and theology are alike dependent upon Biblical criticism. Only when we have rightly dated our sources and placed them in their chronological order can we reconstruct the development of Israel's religion, or trace the growth of early Christianity. And similarly, if we would discover the actual course of events, we must have carried through the criticism of the sources before we proceed to consider the stories which they tell. The processes of historical criticism cannot be discussed here in detail, and the statement must be limited to a few points. Great stress is naturally laid on contemporary documents, or, where these are not available, on such sources as lie nearest to the events. Of course, even contemporary documents cannot be used without caution, for we should have to consider how far the writer was in a position to know the facts, or competent to understand and explain them. We must allow for the bias which may have deflected his judgment and distorted his representation. If we have inconsistent accounts before us, our preference will be determined, not simply by chronological priority, but by the opinion we have formed on the general

qualifications of the two authors for giving us accurate history. But preference for one does not imply that it is to be implicitly followed, or that the other is to be summarily set aside. The source which is better, on the whole, may contain unhistorical elements, while the inferior tradition may retain some genuine reminiscences which its rival has lost. But, perhaps, even more important is the fact that two traditions place us in a much more favourable position than one for reaching the facts. It is the critic's object not simply to get behind his documents to their sources, but to get behind the sources to a still earlier stage of the tradition. Now the existence of two traditions enables him to do this, especially if they are divergent and independent, because he can gradually feel his way back to the source of both by discovering that form of the story from which both can be explained. Yet even when this has been discovered there remains the problem of its historicity, and this has to be determined by a variety of considerations. Among these may be mentioned the nearness of our hypothetical source to the events recorded; the internal consistency of the story; the possibility of fitting it into its general historical context; and its intrinsic probability. We have to consider whether there are motives which were likely to have led to its invention or its distortion. In many instances it is easier to reach negative than positive results; to prove that a book was not written at a given time, or by a given man, than to say when or by whom it was written; to prove that one alleged event did not happen than to prove that another did. Yet even when a negative conclusion has been reached, it does not follow that narratives set aside as unhistorical are therefore of no value. They may be precious in various ways as illustrating the causes which give rise to such stories, as throwing light on the ideals, the tendencies, and conditions of the age in which they originate, and for their intrinsic value, if not as history, yet as poetry or parable.

The argument from silence must be used with great caution. It is proverbially dangerous, yet by no means without value, especially as a confirmation of conclusions reached on positive grounds. There are cases where it is almost conclusive, though we are warned to be careful by the fact that writers are occasionally silent where we should have anticipated that had they known they must have spoken, where, nevertheless, their knowledge is beyond all question. Special importance will be attached by the critic to converging lines of independent evidence. Even comparatively slight arguments, all pointing in one direction and all mutually independent, may, in combination, amount to demonstration, whereas a strong argument standing by itself may fall short of it. A case needs to be scrutinised with special care when it rests on a chain of reasons, for here the argument grows weaker at every step when the inference falls short of certainty, and the chain is no stronger than its weakest link. Again, where one conclusion is only slightly more probable than another it is precarious to build upon it. A very small weight of evidence may readily change the balance of probability. Finally, in view of widespread impressions to the contrary, it may be emphasised that the aim of criticism is not primarily destructive. Naturally much may have to be pulled down, but it is to clear the site for a worthier erection. Nor is criticism as such hostile to the supernatural, though it is obvious that, at least in the New Testament, theology or metaphysics may ultimately control results. Only it is well that critical processes should, as far as possible, be carried along their own lines to at least provisional results, and if theological or metaphysical considerations are

introduced this should not be done surreptitiously. So far as the Old Testament is concerned, the vital problems are unaffected by the question of miracles.

It is not possible to sketch the history of Biblical criticism in anything but the barest outlines. It is not entirely a modern development, but the keenness, the thoroughness, the scientific method employed made the criticism of the 19th century to all intents and purposes a wholly new thing. So far as the Old Testament is concerned, the most important debate has centred about the Pentateuch. Indications of post-Mosaic origin were pointed out by Hobbes, Spinoza, and others; but it was in 1753 that Astruc hit on the difference of the divine names in Genesis—Yahweh and Elohim—as providing a clue to analysis. He did not deny Mosaic authorship, but towards the close of the century Geddes, while recognising a considerable Mosaic element, maintained that the Pentateuch was not the work of Moses, but probably belonged to the reign of Solomon. He did not, however, accept the clue to analysis given by the divine names. De Wette (1806-7) gained a fixed point for future development in his identification of Deuteronomy with the Book of the Law discovered in the time of Josiah. In method, also, he effected a most important advance by the comparison he made between the description of institutions in the early historical books (Chronicles he regarded as largely destitute of historical value) and the corresponding laws in the Pentateuchal codes. So far an Elohist source, a non-Elohist source, and Deuteronomy had been distinguished. In 1833 Hupfeld, who had in this been anticipated by Ilgen (1798), completed the analysis on its main lines with the recognition of two Elohist sources, one having closer affinities with the non-Elohist source than with the other Elohist document. Four main sources were thus recognised, now commonly known by the symbols J, E, D, P. The first two of these contain those elements which give the narratives their perennial charm; the last, on the contrary, the Priestly Document, contrasts strongly with them by its concentration on ecclesiastical institutions and ceremonial, its indifference to human interest, its curiously stereotyped and formal style. Literary analysis, however, had to be completed by the determination of date. The age of Deuteronomy had been roughly determined by De Wette as falling not so long before 621 B.C. It was commonly held that the Elohist source was the earliest, and after Hupfeld's demonstration that two writers used Elohim as a proper name, P was regarded as the older, and E as the younger Elohist. The view that P was the earliest of the documents was dominant till towards the close of the 'seventies, not indeed without protest. Reuss, as early as 1833, had reached, by divination rather than close investigation, the view that the true order of the literature was not Law, Psalms, Prophets, but Prophets, Law, Psalms. In 1835 Vatke and George had both recognised the late date of the priestly legislation. This was important, not in result only, but in method. It involved a clear recognition of the fact that the history of religious institutions was the decisive element in the dating of the documents. Their work remained for long without effect, and thirty years elapsed before Graf published his case for the post-exilic dating of the priestly legislation. Meanwhile, the separation between P and E had been effected. Graf was himself so much under the spell of the dominant belief that the narrative sections of P were very ancient, that he made an unhappy attempt to divide the document, and while making the legislation later than the exile to place the narratives many centuries earlier. It was easy to prove that a document so homogeneous could not be

analysed on these lines; and Riehm, availing himself of Graf's ill-considered admission, argued that the antiquity of the legislation was guaranteed by the antiquity of the narratives, from which it could not be separated. Precisely the opposite influence might, however, be drawn, and Kuenen drew it. Inasmuch as the legislation was demonstrably late, the narratives, since they were inseparable from it, must also be late. The correction was accepted by Graf, who thus carried out his criticism to its logical issue; and so the Grafian theory, which places the Priestly Document after the exile, was stated in its correct form, and attention was concentrated on the real rather than a false issue. Kuenen did much by his *Religion of Israel*, and his brilliant articles in the *Theologisch Tijdschrift*, to commend the hypothesis; but Germany was solid against it till Duhm, in his *Theology of the Prophets*, expressed his adhesion, and contributed a valuable argument in its favour by his proof that the prophets did not presuppose the Law. It was in 1878, however, that the decisive victory was won by the publication of the first volume of Wellhausen's *History of Israel*, which bore in its later editions the title *Prolegomena to the History of Israel*. Since that time the theory has been far the most widely accepted by Old Testament critics. Nor, in spite of frequent assertions to the contrary, is it the case that either the composite character of the Pentateuch or its analysis into four main documents, or yet the view that P is the latest and subsequent to Ezekiel, is in danger of being dislodged from its present acceptance. On these results many mutually independent and mutually corroborating lines of evidence converge; and the more closely the documents are studied, the more the conviction is strengthened that the problem of the Pentateuch has, at least in the main, been correctly solved.

Naturally investigation has not been limited to the Pentateuch, but has extended to the whole of the Old Testament. Space will not permit any sketch of the critical development, nor more than the barest summary of results. Reference must be made to the article on Bible, and to those on the individual books. In the historical literature much has been done to disentangle older and later strata, and to trace the processes of editorial compilation and revision. In this way, even from works in their present form late, older sources of great historical value have been disengaged; while the later sources, and the editorial handling of the history, if less precious for our acquaintance with the periods of which they tell, are invaluable for the light they throw on the periods in which they were composed. The prophetic literature has also been submitted to a very keen analysis. The Book of Isaiah has naturally attracted the most attention. The recognition that chapters xl.-lxvi. are not the work of Isaiah, but later than the exile to Babylon in 586 B.C., was one of the earliest and most assured of critical results. That these chapters are not the work of a single author is now generally recognised, xl.-lv. being commonly assigned, with or without the four Servant Poems, to the second Isaiah; lvi.-lxvi. being composed after the return by one or more writers, for the most part in the 5th century B.C. The problems of the earlier part of the book are, however, much more intricate. It had long been recognised that several sections must be later than the time of Isaiah: xiii. 1-xiv. 23, xxi. 1-10, xxiv.-xxvii., xxxiv., xxxv., being for long admitted to be non-Isaianic. But considerable additions had been made to this list by several scholars before the criticism of the book entered on a new era with the publication of Duhm's *Commentary* in 1892. He detached from Isaiah not a little that had hitherto been left to him, notably happy endings, and in contradiction to accepted

views as to the date at which the canon of the prophets was closed, assigned much to the Maccabæan period. His criticism has had great influence, but his position has not in some of its most characteristic features met with wide acceptance. Jeremiah, which even Graf regarded as largely authentic, has been similarly treated, much being now regarded as due to glossators or editors. Here, again, Duhm's revolutionary conclusions are regarded by most critics as unduly extreme, the more moderate criticism of Cornill commending itself as safer.

On the other prophets there is no space to linger, nor can we speak in any detail of the remaining books. It must suffice to summarise with the utmost brevity the generally accepted results. Job is now commonly regarded as belonging to the former part of the post-exilic period, the speeches of Elihu, the poem on Wisdom, the descriptions of Behemoth and Leviathan, and possibly, though in the present writer's judgment not probably, the speeches of Yahweh being later insertions. The Psalter is in the main post-exilic; some pre-exilic compositions may be preserved, perhaps even a small number of Davidic Psalms. Some scholars tend even to recognise a large number of Maccabæan and even Hasmonæan Psalms. As little would be attributed to Solomon as to David, and that only in Proverbs, which, in the main, is post-exilic. The Song of Songs probably belongs to the Greek period, while Ecclesiastes is scarcely earlier than about 200 B.C. Daniel is Maccabæan, Esther probably late Maccabæan. For a detailed discussion of these problems reference must be made to the relevant articles.

New Testament criticism in its modern scientific form begins with F. C. Baur. Not that important issues had not previously been raised, or notable contributions made to their solution, but it is the imperishable merit of Baur to have lifted the subject out of the atomistic treatment formerly given to it, to have treated individual problems in close connection with each other, and as part of a great connected whole, and to have kept the development of the literature in the most intimate association with the movement of the history and the development of theology. The Tübingen theory, with which his name will be for ever linked, was that the development of the early church started from a conflict of opposite tendencies, Jewish Christianity and Paulinism, and was marked by growing approximation of the parties until they merged in the Catholic Church of the 2d century. Each piece of literature in the New Testament was dated according to the stage of the struggle which the Tübingen critics thought to be reflected in it. Only four Epistles were left to Paul: Corinthians, Galatians, Romans i.-xiv.; the Apocalypse to the Apostle John. As an authentic source for the teaching of Jesus, Matthew was the most trustworthy. Luke was toned down in the interests of Paulinism. Mark, as the most neutral, stood nearest of the Synoptists to Catholicism. The fourth Gospel originated far down in the 2d century; it reflected the union which had been reached in the Church. The Acts of the Apostles was also written from the Catholic standpoint, and refashioned the history of the Apostolic Church, substituting for the sharp antagonism between Paul and the primitive apostles an edifying picture of harmony. The Tübingen position, maintained with massive learning, great critical resourcefulness, and superb skill, failed in spite of its wide acceptance to maintain its ground. Hilgenfeld retrenched it of some of its extravagances. Ritschl offered a new construction in its place. Many of the supports on which the school relied have broken down; many of the detailed results have been abandoned. Literary criticism has been emancipated from the

dominion of a historical theory, and particularly in the case of the Gospels, has reached quite opposite results from Baur's. Thus Mark is almost by common consent now regarded as the earliest of the Synoptists, and the late dates for much of the literature have been set aside, most of it falling in the 1st century. Most of the Pauline epistles are recognised to be authentic. The principle of the development from primitive Christianity to Catholicism was much more complex than Baur realised. Criticism would now relegate the factor which he made all-dominant to a very subordinate position. Yet, when every deduction has been made, it remains true that Baur did much to set us our problems; he asked the right questions, although his answers no longer satisfy us, and his method remains our abiding possession.

Bibliography is sometimes understood to mean expert knowledge of book-production—the history of handwriting and typography, of printing and book-illustrating, paper-making, book-binding, book-selling, book-plates, the rarity and cost of rare works, &c. See BOOKS, BOOK-TRADE, and the articles on the several subjects named. The list of works appended at the end of many of the articles in this work is, in another sense, a brief bibliography for the subject dealt with. In the wider sense, bibliography deals with comprehensive catalogues of books and their authors, essaying to give a conspectus of all the books in some great library; all the books in a language (English, French, &c.), or in a special period; all the books dealing with certain subjects, or a selection of the best of them. And there may obviously be bibliographies of bibliographies. In this sense, bibliography as a branch of learning was enormously indebted to Brunet's *Manuel* (5th ed. Paris, 1860-65) and Watt's *Bibliotheca Britannica* (1824). For Great Britain, standard works of reference are Lowndes, *Manual* (1834); Allibone, *Dict. of British and American Authors* (Phil. 1859-71, with continuations); Sampson Low's *English Catalogue of Books* (1835, continued to the present time); Sonnenschein's *Best Books* (3d ed. 1910); the general catalogue of the British Museum (1881 *et seq.*) and the 'subject index' of modern works added since 1880; *Book Prices Current*; and the *Publishers' Circular* (since 1838). For America there is the *American Catalogue* and *America's Book Prices Current*. For France, besides Brunet, there are Quérard and Lorenz; and for Germany, Heinsius, Kayser, Hinrichs, and others. Of bibliographies of bibliographies, Petzholdt's *Bibliotheca Bibliographica* is first, extended by Stein; and there is a valuable List of Bibliographical Works in the Reading-room of the British Museum.

Bibliomania (Gr. *ta biblia*, 'the Bible,' and *manteia*, 'divination'), a mode of divination by opening the Bible haphazard, and observing the first passage which occurred, or by entering a place of worship and taking notice of the first words of the Bible heard after entering it. The application was often very fanciful, and depended rather upon the mere sound of the words than upon their proper signification or the scope of the passage. Prayer and fasting were sometimes used as a preparation for a mode of consulting the divine oracles. Bibliomania was prohibited, under pain of excommunication, by the Council of Vannes, 465 A.D., and by the Councils of Agde and Orleans in the succeeding century. It continued, however, to prevail for many centuries thereafter, and is said to have been introduced into England at the Norman Conquest. Tennyson introduces it into *Enoch Arden*. It was essentially the same as the famous *Sortes Virgilianæ*, the only difference being in the book employed.

Bibliomania, the passion of the book-miser,

which impels to the gathering and hoarding of books without regard to their literary value or practical utility; or, in its nobler aspect, in Andrew Lang's phrase, the 'love of books for their own sake, for their paper, print, binding, and for their associations, as distinct from the love of literature.' The word in English is modern, having been introduced from France about 1750; but the thing must be in some form as ancient as the existence of printed or written documents. In this, as in other passions of the like kind, the freaks of individual fancy are endless: while one man disdains everything save the 'tallest' copy of a rare work in the finest condition, another takes pity on the dingiest waif of the back-street bookstall. Fashion, too, exercises a great influence on the form in which bibliomania displays itself: it is no longer the prevailing hobby to collect Elzevir and Foulis editions, but he is a special favourite of the gods who possesses a set of the parts of *Pickwick* in the original green paper covers, or of early Thackerays in their original yellow.

See Dibdin, *Bibliomania* (1811); Hill Burton, *The Book Hunter* (new ed. 1882); Percy Fitzgerald, *The Book Fancier* (1886); Andrew Lang, *Books and Bookmen* (1887); Gustave Brunet, *La Bibliomanie en 1833*; W. Roberts, *Rare Books* (1895); J. E. Hodgkin, *Rariora* (3 vols. 1902). See also BIBLIOGRAPHY; and for famous bindings, BOOKBINDING.

Bibra, BARON ERNST VON (1806-78), born in Franconia, wrote on chemistry, was the author of some fine tales, and published an account of his travels in Brazil, Peru, and Chili.

Bicarbonates. See CARBONIC ACID.

Bice (Ger. *Beis*, Ital. *Biadetto*), the name of two pigments of a blue and green colour respectively, known to artists from the earliest times—blue bice as *mountain blue*, *ongaro*, *azzurro di terra*, &c.; and green bice as *chrysocolia*, *Hungarian green*, *verde de Miniera*, *verde de Spagna*, *verdetto*, &c. These pigments consist of a natural clay mixed with yellow ochre, the blue and green colours being due to native carbonate of copper. Bice has not much body, but dries well with oil. There are several artificial varieties, which, however, are not so durable as the natural. Although a favourite with artists in the beginning of the 19th century, its use is dying out, so that it no longer appears in colour catalogues, its place being taken by 'Hooper's Green.'

Biceps ('double-headed'), an anatomical term applied to two muscles, the one belonging to the arm, the other to the leg, and distinguished from each other as the *biceps flexor cubiti* and the *biceps flexor cruris*. The former is the muscle which gives a full appearance to the front of the upper arm; the latter is situated on the back of the thigh, and is one of a group of three muscles known as the 'hamstrings.' See ARM.

Bicester, a market-town of Oxfordshire, 12 miles NNE. of Oxford, and seat of the county court-house. There are manufactures of rope, clothing, sacking, and pale ale, and several important fairs are annually held. The ruins of *Alba Castra*, or Alcester, lie $1\frac{1}{2}$ miles to the south-west, on the ancient Roman Akeman Street. The population of the urban district is 3000.

Bicêtre, a celebrated hospital, situated on a little eminence in the southern neighbourhood of Paris, and commanding one of the finest views of the city, the Seine, and the environs. Founded by Louis IX. as a Carthusian monastery, it was acquired in 1290 by John, Bishop of Winchester (hence the name Bicêtre), and in 1632 it was destroyed, because it had become a hiding-place of thieves. Afterwards, it was rebuilt by Louis XIII., and made a hospital for old soldiers. It was

for a long time used as a prison for criminals, but is now a hospital for indigent old men and for incurable lunatics.—Bicêtre is also the name of one of the sixteen detached forts that defend the approaches to the walls of Paris.

Bichat, MARIE FRANÇOIS XAVIER, an epoch-making anatomist and physiologist, was born in 1771 at Thoirrette, in the department of Jura. He studied chiefly in Paris under Desault, who adopted him as his son, and whose surgical works he edited. In 1797 he began giving lectures on anatomy, along with experimental physiology and surgery, and in 1800 was appointed physician to the Hôtel-Dieu. Worn out by his unrelenting labours, he died of fever in his thirty-first year, July 22, 1802. He was the first to simplify anatomy and physiology by reducing the complex structures of the organs to the simple or elementary Tissues (q.v.) that enter into them in common. This he has done in his *Anatomie Générale* (2 vols. 1801). In his *Recherches Physiologiques sur la Vie et la Mort* (1800), he discusses all the functions of organic and animal life, and their mutual relations.

Bickerstaffe, ISAAC, popular play-writer, was born in Ireland about the year 1735, and at the age of eleven became page to Lord Chesterfield, the lord-lieutenant. He was afterwards an officer of marines, but was dismissed the service for some discreditable offence, and in 1772 had to flee the country on a capital charge. Nothing is certainly known regarding his after-life, but he is supposed to have died on the Continent in or soon after 1812. Of his numerous pieces, produced between 1766 and 1771, the best-known are: *The Maid of the Mill*, *The Padlock*, *He Would if He Could*, *Love in a Village*, *The Hypocrite*, and *The Captive*.—Under the nom de guerre of 'Isaac Bickerstaff,' Swift wrote works in 1708-9; and the same name was used by Steele in the *Tatler*.

Bickersteth, EDWARD, evangelical clergyman, was born at Kirkby Lonsdale, Westmoreland, in 1786, and after fifteen years in the General Post-office and in a solicitor's office, was in 1815 admitted to orders, and sent the next year by the Church Missionary Society to reorganise their mission stations in Africa. Having accomplished his mission, he was in 1816 appointed secretary to the Society, a post he filled with great success until 1830, when he became rector of Watton, Hertfordshire. Here, until his death on February 24, 1850, he took an active part in promoting, both by tongue and pen, almost every work having for its object the spread of religious truth whether at home or abroad. He was one of the founders of the Evangelical Alliance. Of his religious writings, which were collected in 16 vols. (1853), the most popular are: *A Help to the Study of the Scriptures*, *The Christian Student*, and *A Treatise on the Lord's Supper*. He also edited *The Christian's Family Library*, a work consisting of 40 vols. His *Christian Psalmody* went through 59 editions in seven years. It formed the basis of the well-known *Hymnal Companion*, now in use in more than 2000 churches, prepared by his son, EDWARD HENRY BICKERSTETH, born in 1825, who, from 1885 till his death in May 1906 (Evangelical) Bishop of Exeter, was author of *Yesterday, To-day, and For Ever*, and other poems (see his Life, 1907).—HENRY BICKERSTETH (1783-1851) in 1836 became Master of the Rolls, and was raised to the peerage as Baron Langdale; and ROBERT BICKERSTETH (1816-84) was Bishop of Ripon from 1857.

Bicycle. See CYCLING.

Bidar, a town in the Nizam's Dominions, near the right bank of the Manjira, a tributary of the Godavary, 75 miles NW. of Hyderabad. Formerly a place of importance, it is now remarkable chiefly

for its manufactures in a compound metal made of tin, copper, lead, and zinc, and called Biddery ware. Pop. 13,000.

Bidasso'a, a river which, rising in Spain, forms the boundary between that country and France, and, after a course of 33 miles, falls into the Bay of Biscay at Fuenterrabia. During the Peninsular war its banks were the scene of several conflicts.

Bideford, a city of Maine, U.S.A., on the right bank of the Saco River, 6 miles from its mouth in the Atlantic Ocean, opposite the town of Saco (q.v.). It has manufactures of cotton and woollen goods and machinery, and there is a large trade in timber. It was settled about 1630, and named by settlers from Bideford in England. Pop. 18,000.

Bidder, GEORGE PARKER (1806-78), born on the edge of Dartmoor, was from his amazing powers of mental arithmetic exhibited by his father as a phenomenon, and was known as 'the Calculating Boy.' He studied at Edinburgh University, and was associated with Robert Stephenson as a railway engineer. He planned the Victoria Docks in London, helped to found the first electric telegraph company, and was most skilful in parliamentary committee work. His son was an eminent K.C.

Bidding-prayer, a form of exhortation, always concluding with the Lord's Prayer, enjoined by the 55th canon of the Anglican Church, in 1603, to be used before all sermons and homilies. Except in cathedrals and the university churches, it is now seldom used. Such a form was anciently used for the communicants or believers after the dismissal of the catechumens, and was pronounced by the deacon, each petition beginning with the words 'Let us pray for,' and the people responding at the end of each with 'Kyrie Eleison,' or some such words. *Bidding* means properly praying, so that *bidding prayers* means saying prayers; but as this sense of the word bid went out of use, *bidding prayer* was thought to mean enjoining prayer, and finally the form of injunction.

Biddle, JOHN, sometimes called the founder of English Unitarianism, was born in 1615, at Wotton-under-Edge, in Gloucestershire, and in 1634 entered Magdalen Hall, Oxford, where he took his degree of M.A. In 1641 he was elected master of the free school in the town of Gloucester; but having embraced certain opinions in regard to the personality of the Holy Spirit, at variance with those held by the majority of Christians, he was thrown into gaol, December 1645. He was summoned before the parliament at Westminster, tried, and thrown into prison. The famous Westminster Assembly of Divines undertook to 'settle' Biddle's case, but their arguments had only the effect of strengthening his previous convictions. His work on the Holy Spirit, issued in 1647, was burnt by the hangman as blasphemous. In 1648 he published a *Confession of Faith concerning the Holy Trinity*, which was followed by another tract containing the opinions of the Fathers on the same question. Parliament had passed an act declaring the denial of the Trinity a crime punishable by death, and the Westminster Assembly besought parliament to have Biddle executed. Parliament did not respond to this appeal, he never was brought to trial, and personal friends secured his liberation by becoming surety for his appearance when wanted. Cromwell's Act of Oblivion gave him full liberty. He now commenced to gather a congregation of those whom he had converted to his opinions. Twice during the Commonwealth Biddle suffered severely for his creed, and in 1655 was banished to one of the Scilly Isles. In 1658 he was released, and continued to preach in London till the death of Cromwell, and also after the Restoration, until June 1662, when he was again apprehended and fined in £100.

He could not pay it, so was committed to gaol, where he died 22d September of the same year. See UNITARIANS.

Biddle, NICHOLAS, an American financier, born at Philadelphia, January 8, 1786, graduated at Princeton College, and became an energetic member of the legislature of Pennsylvania. In 1823 he was appointed president of the United States Bank, and held that post till 1836. He was next chosen president of the United States Bank of Pennsylvania, but resigned in 1839; two years later the bank became insolvent. He had conducted its affairs with great skill, integrity, and prudence, and he published a series of letters in vindication of his administration. A presentment was made against him for fraud, which was never followed up. Biddle had considerable literary taste, and for some time edited *The Philadelphia Portfolio*, contributing many articles to its pages. By request of the president of the United States, he compiled from the original papers a *History of Lewis and Clarke's Expedition to the Pacific Ocean*; also *The Commercial Digest*, a volume put forth by Congress. He died February 27, 1844.

Bideford, a 'little white seaport town' of North Devon, on both sides of the Torridge, 3½ miles above its confluence with the estuary of the Taw, and 9 miles SW. of Barnstaple. The name signifies 'by-the-ford,' and is pronounced *Bid-de-ford*, like that of its American daughter. The old bridge of 24 arches and 226 yards long, which unites the two divisions of Bideford, was widened in 1864. The church was rebuilt, all but the tower, in 1864. There are manufactures of ropes, sails, earthenware, and leather; and these are exported, together with oak-bark, corn, flour, linens, woollens, iron, &c. Vessels of 500 tons can get up to the quay. Population, 9000. A place of Viking sepulture, Bideford was the port whence Sir Richard Grenville sailed on his last voyage, and it figures much in Kingsley's *Westward Ho!*

Bidpai, also PILPAY, the reputed author of a collection of fables and stories widely circulated both in the East and West, of which the earliest extant form exists in an Arabic version of about 750 A.D. The original was an Indian collection of tales which are not now in existence, but of which the *Panchatantra* (q.v.), and to a lesser degree the *Mahābhārata* (q.v.) and the *Hitopadesa* (q.v.), contain each a part, though in a modernised and artificially elaborated form. Of this Indian original, the classical and elegant Arabic version, *Katīlah wa Dimnah*, already spoken of, is a substantially faithful reproduction. It was not made, however, direct from the Sanskrit, but from a lost Pehlevi version, the parent also of an incomplete old Syriac version, dating from about 570, which was discovered in the episcopal library at Mardin at the time of the Vatican Council, and published in 1876 by Bickell with an introduction by Benfey. Save this, every known version of the book descended directly or indirectly from the Arabic version of Abdullah-ibn-Almokaafa of 750. This work as it exists is made up of three elements: Indian, Persian, and Arabic, three chapters being Persian, and six appearing first in the Arabic version, while twelve chapters are of Indian and Buddhist origin. Of these last, five correspond to the five chapters composing the *Panchatantra*, two appear in the first book thereof, three are found in the *Mahābhārata*, and two seem to have fallen out of the Indian literature altogether. However, if Buddhism originated the book, it was Islam which transmitted it to Europe, for no fewer than five different translations were made from the Arabic version—into Syriac (10th or 11th century); Greek (about 1080 by Symeon Seth); Persian (about 1120,

a somewhat free translation, known as that of Nasrullah); Hebrew (13th century by Jacob ben Eleazar); and Old Spanish (1251, from which Raimund's Latin version was made in 1313). A somewhat earlier Hebrew version formed the basis of the *Directorium* (about 1270) of John of Capua, a converted Jew; which in turn gave rise to German by Graf Eberhard (about 1480); Spanish, the *Exemplario* (1493); Italian, (Doni's *Moral Filosofia* (1552), and Firenzuola's *Discorsi degli Animali* (1548); French; English (1570); Danish (1618); and Dutch (1623) versions. The English edition was a rendering by Sir Thomas North (1570) of the Italian *Moral Filosofia* of Doni. The Persian of Nasrullah gave birth to the *Anwārī-Suhailī*, or 'Nights of Canopus the Star' (late in 15th century), of Husain Wā'iz, which in turn gave rise to the Turkish *Humāyūn Nāmāh*, or 'Imperial Book' (early in 16th century).

As to the original transmission of the book from India, the story is told that the Persian king Khosrū Nūshirvān (531-79), hearing of its existence in India, despatched his physician Barzōye to India to procure and translate a copy of it into Pehlevi, the literary dialect of Persia. Its translator into the older Syriac version was an ecclesiastic named Būd (or Bōd); into Arabic, the elegant and accomplished but ill-fated scholar, 'Abdullah Ibn-al-Mokaffā.' Of this work each chapter forms a story which is supposed to have been related to a king of India by his philosopher, Baidaba or Bidpai, to point some moral. The story itself is simple in form, but usually branches out into a number of parenthetical stories, conversations, and sayings. In many of the stories animals play parts, and act as if men and women. With the chapter on the lion and the ox, or how two friends may be set at variance by a crafty interloper—the fifth in De Sacy's text—we enter on the original Indian book. The name given to the book, in Arabic *Kalīlah and Dimnah*, in Syriac *Kalīlag and Dammag*, is derived from the Indian names of the two jackals who take a principal part in this story. Perhaps the most pleasing story in the book is that of the ringdove, or the love of sincere friends. The 14th chapter in De Sacy, the story of the king and his dreams, is unmistakably Buddhist, the Brahmans in it being presented in the most odious light. In this story none of the parts are taken by animals. The account of the mission of Barzōye to India, and his biography, are given in all the versions except the later Syriac just before the story of the lion and the ox, and after the table of contents. The prominent part which asceticism plays in this biography Benfey connects with Buddhism, then in full vigour in India.

An eclectic text of the Arabic version was edited by Silvestre de Sacy (Paris, 1816), and has been translated into English by Knatchbull (Oxford, 1819), and into German by Phillip Wolff (2 vols. Stutt. 1839). The later Syriac version was edited by Professor Wright (1884), and was translated into English, with an excellent introduction, by the late I. G. N. Keith-Falconer (1885).—See also Loiseleur Deslongchamps, *Essai sur les Fables Indiennes* (Paris, 1838); Max Müller, 'On the Migration of Fables,' in vol. iii. (1880) of *Chips from a German Workshop*; and Rhys Davids, *Buddhist Birth Stories* (1880).

Biebrich, a town on the right bank of the Rhine, 2½ miles S. of Wiesbaden; pop. 20,000. It has the castle of the Dukes of Nassau, and manufactures cement, manures, sulphuric acid, and stucco.

Biel. See BIENNE.

Bielefeld, a busy town in the Prussian province of Westphalia, picturesquely situated on the little Lutter, at the foot of the Teutoburger-Wald,

28 miles SW. of Minden. The old walls which withstood the last siege in 1673, have been converted into promenades. Bielefeld is the centre of the Westphalian linen-trade. Its industries include spinning, weaving, bleaching, dyeing. Among its manufactures are silk, motor-cars, cycles, weighing and other machinery, cranes, pulleys, tobacco and meerschaum pipes. Pop. 80,000.

Bieleff, an ancient town of Russia, in the government of Tula, on the Oka, 160 miles SSW. of Moscow; pop. 10,000.

Bielitz, or BIELSKO, a town of Poland, on the left bank of the Biala, 60 miles SW. of Cracow by rail. It has dye-works, and carries on a trade in woollen cloths, wine, and salt. Pop. 18,000.

Biella, a town of north Italy, in the province of Novara, 56 miles NE. of Turin by rail. It has some manufactures (including felt hats), and is the seat of a bishop. Pop. 20,000.

Biëlo-ozero ('White Lake'), a lake in the government of Novgorod, Russia, covering an area of 432 sq. m., its length being about 25 miles, and its breadth 20. Its surplus waters are conveyed by the Sheksna River into the Volga, and canals unite it with the Onega, Sukona, and Dwina.—BIELO-ZERSK is an old wooden town on the south shore of the lake; pop. 5000.

Bielopol, a town of Ukraine, 106 miles NW. of the city of Kharkov, with extensive brandy distilleries; pop. 16,000.

Bielostok. See BIALYSTOK.

Bielshöhle, a stalactite cavern in the Harz Mountains, on the right bank of the Bode. It was discovered about 1672, but first made accessible in 1788. Its entrance is 108 feet above the bed of the stream, and its total length is 230 yards.

Bielsko. See BIELITZ.

Bienne, in German BIEL, a town of Switzerland, in the canton of Bern, 56 miles SW. of Basel by rail, beautifully situated at the base of the vine-clad Jura, and at the foot of the Lake of Bienne. Population, 35,000, engaged in the manufacture of watches, leather, cotton, &c. Bienne is mentioned as early as 814. From 1262 it belonged to the bishops of Basel; but in 1352 it entered into an alliance with Bern, and after the Reformation was essentially a free and independent city until 1798, when it was annexed to France. In 1815 it was united to Bern.—The LAKE OF BIENNE, lying 1424 feet above sea-level, extends 9 miles north-eastward along the base of the Jura Mountains, its greatest breadth being 3 miles. It receives the surplus waters of Lake Neuchâtel by the Thiel, by which river it again discharges its own. Its maximum depth is 256 feet. Towards its head is the Île St Pierre, to which Rousseau retired for two months in 1765.

Biennials, or BIENNIAL PLANTS, are plants which do not flower in the first season of their growth, but flower and bear fruit in the second season, and then die. The most familiar example is perhaps that of the common foxglove (*Digitalis*). Many of our cultivated plants are biennials, as the carrot, turnip, parsnip, parsley, celery, &c., and many of the most esteemed flowers of our gardens, as stock, wallflower, honesty, &c. But plants which in ordinary circumstances are biennials, often become Annuals (q.v.), when early sowing, warm weather, or other causes promote the earlier development of a flowering stem, as is continually exemplified in all the kinds already named. If, on the other hand, the flowering of the plant is prevented—or, in many cases, if it is merely prevented from ripening its seed—it will continue to live for a much longer period; the same bed of parsley, if regularly cut over, will remain productive

for a number of years, while a normally annual plant like *mignonette* may be kept growing for two years or more if its flowering be carefully prevented.

Bierstadt, ALBERT (1830-1902), born at Düsseldorf, went as a child to the United States, but studied painting in Europe. In 1859 he visited the Rocky Mountains, and settling near or in New York, made the artistic representation of mountain scenery his life-work.

Bies-Bosch, a marshy sheet of water with an area of 77 sq. m., between North Brabant and South Holland.

Bigamy, in the canon law, meant the contracting of a second marriage. The term was applied to a second marriage even when the prior marriage had been dissolved. Second and subsequent marriages, while allowed by the canon law, were regarded with disfavour. Thus a person contracting such a marriage was not admitted to holy orders. The nuptial benediction was not given at the second marriage of a woman, though it was given at the marriage of a widower with a virgin.

In the ordinary English use of the word, bigamy is the entering into a second marriage while the former marriage still subsists. In England it originally was a purely ecclesiastical offence, but by the statute of 1604 it was made a felony. The enacted law on the subject is now contained mainly in the Offences against the Person Act, 1861. The offence is punishable with penal servitude for not more than seven nor less than three years, or with imprisonment for not more than two years, with or without hard labour. The gravity of the crime varies greatly according to the particular circumstances and the degree of deceit practised. The Act of 1861, while declaring the second marriage generally felonious, excepts certain cases. These excepted cases are: (1) A second marriage contracted elsewhere than in England or Ireland by any other than one of his Majesty's subjects. But a person who is a British subject is guilty of the crime whether the second marriage took place within or without the king's dominions. (2) A second marriage by one whose husband or wife has been continuously absent from such person during the seven years preceding the second marriage, and has not during that time been known by such person to be living. (3) A second marriage by one whose first marriage had been validly dissolved before the celebration of the second marriage. The divorce must be a legal one—that is to say, must be legal by the law of the country where the divorced parties were domiciled at the time.

To constitute the crime, the first marriage must have been valid according to the law of the country where it was celebrated, and the second marriage must also have been in a form recognised by the law of the place where it was celebrated. It must also be proved that the first wife or husband of the accused was still living at the date of the second marriage. It is now settled in England that, even though the first husband or wife has not been absent for the period of seven years preceding, or has been heard of during that period, it is nevertheless a good defence to a charge of bigamy if it can be proved that the accused had an honest *bona fide* belief, founded on reasonable grounds, that his or her first wife or husband was dead. The man or woman who, in knowledge of the facts, goes through the ceremony of marriage with the bigamist may be indicted as a principal in the second degree in England, and as art and part in Scotland. Formerly the first wife or husband was not a competent witness for the prosecution; but, by the Criminal Justice Administration Act, 1914, the husband or wife of a person accused of bigamy may be called as a witness either for the prosecution

or for the defence, and without the consent of the person accused.

In Scotland bigamy is a crime both at common law and under an Act of 1551. The essentials of the crime are the same in Scots as in English law. But in Scotland seven years' absence of the accused's original spouse is not recognised as a conclusive defence, the rule simply being that the accused cannot be convicted if he or she proves that at the time of the second marriage he or she had reasonable grounds for believing that the other spouse was dead.

Marriage between persons one of whom is already lawfully married to another is of course void. But in Scotland *bona fide* belief—i.e. error of fact on the part of either of these persons—is sufficient to legitimate the children of the union. The same rule formerly held in England, but no longer does so.

In the United States the law on this subject is in most respects uniform with the law of England. It has, however, been decided in the United States, contrary to the rule now established in England, that even an honest belief in the death of the other spouse will not avail as a defence to the spouse who remarries within the limit of seven years provided for in the bigamy statute. It is no defence that polygamy is a religious privilege sanctioned by local usage.

Bigelow, the name of several notable Americans, of whom the most important are—(1) ERASTUS BRIGHAM (1814-79), born in Massachusetts; invented, while yet a lad, looms for weaving suspender webbing and piping cord, and afterwards constructed a machine for making knotted counterpanes, and a valuable loom for weaving carpets.—(2) JACOB (1787-1879), physician, born in Massachusetts; graduated at Harvard University in 1806, and early became known as a skilful botanist. He practised for over forty years in Boston, and filled several chairs at Harvard. His professional publications are numerous, and the single-word nomenclature of the *American Pharmacopeia* of 1820, afterwards adopted in England, is largely due to him.—(3) JOHN (1817-1911), born at Malden, New York, was managing editor of the *New York Evening Post* from 1850 to 1861, when he went as consul to Paris. From 1865 to 1866 he was United States Minister in France, and in 1875-77 was secretary of state for New York. He wrote *Lives of Fremont* (1856), *Cullen Bryant* (1886), and *S. J. Tilden*, besides editing Franklin's *Autobiography* from the original MSS. which he found in France (1868; new ed. 3 vols. 1875) and Franklin's *Complete Works* (1886). He contributed the article FRANKLIN to this *Encyclopædia*.—His son POULTNEY, born in 1855, a travelled journalist, has written much on the Emperor William II. and things German and Russian.

Bigg. See BARLEY.

Biggar, a town of Lanarkshire, 28 miles SW. of Edinburgh. The Collegiate Church of St Mary was founded in 1545. Dr John Brown, author of *Rab and his Friends*, was a native. Pop. 1500.

Biggleswade, a Bedfordshire urban district, 40 miles N. of London, with a great corn-market; pop. 5400.

Bighorn. See SHEEP.

Big Horn, a navigable river of the United States, and the largest affluent of the Yellowstone, rises near Fremont's Peak in the Rocky Mountains, in the NW. of Wyoming. It has a north-east course of about 350 miles.

Bignoniaceæ, a tropical order of sympetalous dicotyledons, closely allied to the Scrophulariaceæ (q.v.), from which they may be distinguished by the longitudinal dehiscence of the capsule, and by their winged exalbuminous seeds (see TRUMPET-

FLOWER). They are in many cases noble trees, and some of them afford valuable timber, among which may be named *Bignonia leucoxydon*, a tree of Jamaica, which is sometimes imported for cabinetmakers, &c. under the name of green or



Bignonia radicans.

yellow ebony; some Brazilian species (*Jacaranda brasiliensis*) furnish exceedingly hard and beautiful timber. Not a few of them are climbing shrubs (lianas), and the tough shoots of *Bignonia kerere* are used for wicker-work in Guiana. *Bignonia alliacea*, a native of the West Indies, is remarkable for its strong alliaceous smell; the leaves of *Bignonia Chica* afford the red colouring matter called Chica (q.v.).—Some are herbaceous; of these the most important is *Sesamum* (q.v.).

Bigod, the name of a family founded by a poor Norman knight, which acquired the earldom of Norfolk in the reign of Stephen. The second earl, Roger, took a prominent part in securing Magna Charta; in 1306 the earldom became extinct.

Bigorre, a mountainous district of South-west France, formerly belonging to Gascony, but now for the most part embraced in the department of Hautes-Pyrénées. Tarbes (q.v.) has been the chief town since the days of the Romans. See BAGNÈRES.

Big Sandy River, also called *Chatterawah*, a navigable affluent of the Ohio, formed by the junction of two branches which rise in Virginia. The west fork runs through Kentucky, and the east fork in its lower course bounds these states.

Bihać, or BIHACZ, a strong fortress-town of Yugoslavia, in north-west Bosnia, on the Una, near the Croatian border. It was the scene of frequent contests during the Turkish wars, and there is a fine monument to the Austrians who fell in the campaign of 1878. Pop. 6200, mostly Mohammedans.

Bihar. See BEHAR, BEHAR AND ORISSA.

Bihari, one of the Hindu group of Indian languages. See INDIA.

Bihé, a fruitful native kingdom of Portuguese West Africa. The eastern part rises to a lofty plateau, where the climate is delightful. Bihé was an important caravan centre, as the only route across the continent south of the Congo passed through it. The trade in slaves and ivory was once great. Area, 2500 sq. m. Kagnomba, the king's capital, is more than 3 miles in circumference. See Major S. Pinto's *How I Crossed Africa* (1881).

Bijanaghur. See VIJAYANAGAR.

Bijapur, a decayed city in the Bombay Presidency, 160 miles SE. of Poona. It was for centuries the flourishing capital of a powerful kingdom, but fell therewith under various dynasties in succession, Hindu and Mussulman, till in 1686 it was captured by Aurungzebe. It passed during the

early part of the 18th century into the hands of the Mahrattas, and became British in 1848. Now that a gradual decay has done its worst, Bijapur presents a contrast perhaps unequalled in the world. Lofty walls of hewn stone, still entire, inclose the silent and desolate fragments of a once vast and populous city. With the exception of an ancient temple, the sole relic of aboriginal domination, the ruins are Mohammedan, and consist of beautiful mosques, colossal tombs, a fort, with an inner citadel, a mile in circuit. The British government has done everything to prevent further decay. Pop. 28,000. See Fergusson's *Indian Architecture* (1876).

Bijawar, a petty native state in the Bundelkhand Agency, with an area of 973 sq. m. Diamonds and ironstone are found, but the country is poor and hilly. Pop. 125,000.

Bijharu, BIJBHARA, or BIJBAHAR, the second city in Kashmir state, India, on the Jhelum, 25 miles SE. of Srinagar; pop. 5000.

Bijnaur, a town of the United Provinces, 3 miles E. of the Ganges. Sugar, Brahmanical threads, and cotton cloth are manufactured. It is a seat of the American Methodist Mission and headquarters of the Jâts. Pop. 17,000.—The district of Bijnaur, in the N. of the Rohilkhand division, contains more than a dozen towns with a population of over 5000. It has an area of 1800 sq. m., and a pop. of 800,000.

Bikaner, the capital of a Rajput state, lies in a desolate tract, 250 miles WSW. of Delhi. It is surrounded by a battlemented wall of $3\frac{1}{2}$ miles in circuit, and from a distance presents a magnificent appearance; but many of the carved buildings for which it is notable are situated in narrow and dirty lanes, and the people are extremely dirty. There are seven Jain monasteries. Pottery, stone-cutting, and carving, the making of a white candy and of blankets, are amongst the industries of the place. Population, 70,000.—The state contains 23,300 sq. m., and a pop. of 660,000. The Rajputs are the dominant race; but Jâts form the great body of the inhabitants. The greater part of the state is a dreary, undulating plain interspersed with shifting sandhills, grass, and jungle bushes. The horses, cattle, and buffaloes of Bikaner are famous. The climate is remarkable for extreme changes of temperature.

Bikh is an Indian poison. See ACONITE.

Bilbao, a town of Northern Spain, the capital of the Basque province of Vizcaya (Biscay), is situated in a mountain gorge on the Nervion, 8 miles SE. of its mouth at Portugalete. Bilbao is well built; the principal streets are straight and the houses substantial; but there are no public buildings of particular note. Five bridges span the river, which divides the old town from the new. The old fame of Bilbao's iron and steel manufactures is attested by the terms *bilbo*, 'a rapier,' and *bilboes*, 'irons'—both common in Elizabethan writers. Bilbao has shipbuilding yards, dry docks, and tar-distilleries, as well as iron and steel works, but the city is commercial rather than industrial, being the principal port in northern Spain and the outlet for the rich iron-mines of the district. Great Britain takes most of the iron ore exported. Other exports are wine (for America) and rope-soling shoes. The chief imports are British coal and coke, Norwegian dried cod, Swedish timber, and petroleum. The narrow bed of the Nervion has repeatedly been widened and deepened so as to permit vessels of 4000 tons to come up to the town at high tide; the river-mouth has been protected, and many ships come only to the outer harbour. A free depôt was opened in 1920.

Thousands of emigrants embark annually for the Argentine. Bilbao enjoys excellent railway and electric tramway facilities on the whole, but the railway route to Madrid is devious, and consequently Bilbao's inconvenient connection with the south of Spain hinders its development as a main gateway of the peninsula. The town has grown rapidly; the population, in 1887 not much above 50,000, had in 1920 increased to over 114,000. Bilbao was founded in the year 1300 by Diego Lopez de Haro under the name of Belvao—i.e. 'the fine fort'—and soon attained great prosperity. In the 15th century it was the seat of the most authoritative commercial tribunal in Spain. It suffered severely in the wars with France, first in 1795, and again in 1808, when 1200 of its inhabitants were slaughtered in cold blood. During the Carlist struggles Bilbao has stood two great sieges, Zumalacarreguy here receiving his death-wound in 1835, whilst in 1874 the place was vainly besieged and heavily bombarded by the forces of Don Carlos for four whole months.

Bilberry. See WHORTLEBERRY.

Bilbils, an old Iberian city of Spain, 2 miles E. of the modern town of Calatayud (q.v.), in the province of Saragossa, chiefly celebrated as the birthplace of the poet Martial, but also famed for its highly tempered steel blades.

Bilcock. See RAIL.

Bilderdijsk, WILLEM, a Dutch poet and philologist, was born at Amsterdam, 7th September 1756. While studying law at Leyden, and afterwards, when practising at the Hague, he devoted himself assiduously to literature and poetry. On the invasion of Holland by the French he repaired to Brunswick, and afterwards visited London, where he supported himself by lecturing and teaching. In 1806 he returned to Holland, where he was received as one who had done his country honour; and the newly-elected king of Holland (Louis Bonaparte) appointed him president of the new Institute at Amsterdam, and also made him his own instructor in the Dutch language. Bilderdijsk afterwards resided at Leyden and then at Haarlem, where he died 18th December 1831. His contributions to poetic literature were very numerous; but though his lyrics especially contain many beauties, yet, with one or two exceptions, none of his poems display any remarkable originality, or any great wealth of imagination. He also made valuable contributions to the exposition of the older monuments of Dutch literature, and wrote a history of the Netherlands. He was strongly conservative in his tendencies, theological and other. His collected poems have been edited by Da Costa (Amsterdam, 1856-59).

Bile is a fluid secreted from the blood by the liver. One part of it is destined to serve in the process of digestion; the other to be eliminated from the system. It is coloured yellow in man, and in carnivorous and omnivorous animals; it is green in vegetable feeders. The primary cells of the liver (the hepatic cells) separate the bile from the blood of the portal vein, and discharge it into small ducts, which unite to form larger ones, and eventually the right and left hepatic ducts. The latter unite to form the common hepatic duct, which is soon joined by that of the gall-bladder (the cystic duct). This junction forms the common bile duct, which pierces the second part of the duodenum, and running obliquely in its wall for a short distance, opens on its mucous surface.

Bile is constantly being secreted, more copiously after food; while the duodenum is empty, most of it passes up the cystic duct into the gall-bladder where it is stored. But when the contents of the

stomach are carried past the opening of the common bile duct, a copious flow of bile takes place into the duodenum, where it is mixed with the food, in order to aid the further processes of digestion.

The composition of human bile is on the average of

Water.....	about 86 per cent.
Bile-salts.....	" 9 "
Mucin.....	" 2 "
Other organic substances.....	" 2 "
Inorganic substances (ash).....	" 0.6 "

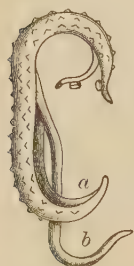
The *bile-salts* (glycocholate and taurocholate of soda) are the most important constituents. If an animal membrane be wetted with a solution of these salts, it allows fatty substances to filter through it much more readily than if pure water or a solution of an inorganic salt be used; and this property aids in the absorption of fatty foods by the intestine. The bile-salts also assist in the emulsification, and to a certain extent, in the solution of fats. The *mucin* gives bile its viscid consistence. The other organic constituents include *fats and soaps*; *cholesterin*, chemically an alcohol, a crystallisable substance which is usually the chief constituent of biliary calculi or gall-stones (see CALCULUS); and the *bile-pigments*. The ash contains a trace only of iron, most of that derived from broken-down blood corpuscles being stored in the liver for future use.

Human bile has the specific gravity of about 1026 (water = 1000), is of a ropy consistence, with usually a yellowish-brown colour; does not readily mix with water, but sinks therein, and only after repeated agitation becomes diffused through the water, which then assumes a frothy appearance resembling soap-suds. Bile has a bitter taste and a faint musky odour. Besides aiding in the digestion of fats, bile stimulates the various muscular fibres of the intestine, and thus aids both the absorption and the propulsion of its contents; while the mucus it contains acts as a lubricant. It has also an antiseptic action, diminishing the putrefactive changes of the intestinal contents. Should, from any cause, the elements of the bile be in excess in the blood, or should the liver suspend the function of secreting it, not only is digestion imperfectly performed, but the general health suffers from the impure condition of the blood, and the patient is said to be *bilious*. On the other hand, the bile may be secreted, but its escape interfered with, and then its reabsorption will produce Jaundice (q.v.). See also the articles LIVER and DIGESTION.

BILIOUS ATTACK.—When the functions of the liver are temporarily interfered with, and particularly the secretion of bile diminished, most often in consequence of imprudence in eating or drinking, a *bilious attack* results. The liver, however, is rarely if ever affected alone, the stomach and intestines being also disordered; in most cases the stomach is probably the first to suffer. There are pain and discomfort in the abdomen, usually headache, and a yellowish discoloration of the skin and whites of the eyes; the tongue is furred and the appetite impaired, and the temper often becomes very irritable. Vomiting and diarrhoea often occur, and are in such a case salutary processes. The administration of a purgative is beneficial; and the food taken, if any, must be small in amount, simple, and readily digestible—e.g. milk with potash water, toast, biscuits, &c. See LIVER.

Bilge (sometimes spelled BULGE) is the part of the bottom of a ship nearest to the keel, and always more nearly horizontal than vertical. A ship usually rests on the keel and one side of the bilge when aground. The name of *bilge-water* is given to water which finds its way into the bilge or lowest part of a ship, and which, when not drawn off by the pump, becomes dirty and offensive.

Bilharzia (*Schistosomum hæmatobium*), a formidable Trematode parasite of man in the portal system and renal veins, causing inflammatory lesions, hæmaturia, stone, and many complications. It is common in Africa; in Egypt about a



Bilharzia:
a, male; b, female.

third of the native population is infected. The worm is in some respects very divergent from the usual 'flake' type. Thus the sexes are separate, and the male (10-15 millimetres in length and white in colour) has the margins of its flat body folded inwards to form a canal, in which the female (cylindrical and 15-20 mm. in length) is carried until fertilisation is effected. The fertilised females migrate into and tend to choke small veins, especially in the region of the bladder. The hard-shelled eggs have a terminal spine, and contain a ciliated embryo when they pass out from man in the urine. In water or in moisture the ciliated larva emerges and enters a fresh-water snail (species of *Planorbis*, *Bullinus*, *Melania*), as Dr R. T. Leiper discovered. The larva becomes a sporocyst, which gives rise to daughter-sporocysts, and inside these cercariæ develop. (See FLUKE.) The fork-tailed cercariæ leave the snail and swim in the water or creep along by means of their two suckers. They enter the human skin, especially if there is a scratch or wound; they pass into the lymphatic system and thence into the venous system, or into the venous system directly. They may also enter by the mouth in drinking-water. In stored water they die in thirty-six hours; and they are very sensitive to tabloids of sodium bisulphate. The chief source of infection is from unfiltered water used in washing and watering. Another species (*S. mansoni*), reported from man in Brazil, has eggs with a lateral spine; another (*S. japonicum*) occurs in man and cat, in the arterial as well as in the venous system, in Japan and China, and is associated with enlargement and cirrhosis of the liver. The cercariæ enter through the skin from the water of the rice-fields, or the like. See E. Brumpt, *Précis de Parasitologie* (1910), and R. T. Leiper, *Journ. Royal Army Medical Corps*, cxvi. (1915).

Biliary calculus. See CALCULUS.

Bilimbi. See CARAMBOLA.

Bilin', a town of Bohemia, on the Bila, 5 miles SW. of Teplitz, and famous for its mineral springs, which belong to the alkaline group, and are remarkably rich in native carbonate of soda. The waters and their various mineral constituents are exported in great quantities, and the springs are largely sought by sufferers from gastric, catarrhal, or scrofulous complaints. The town, from 1464 the seat of the princes of Lobkowitz, whose castle rises near by, is surrounded with basalt crags, and in its vicinity is a remarkable isolated clinkstone rock, 1754 feet high, Borzenberg or Biliner Stein. Pop. 8000.

Bill, in Natural History, the horny, toothless, and lipless jaws of birds. (a) *Structure*.—The foremost bones of the skull (mainly, the premaxillæ, but also the maxillæ and nasals) are elongated in variable degree and form, and are covered with a horny sheath. The same is true of the lower jaw or mandible, and the result is a bill. The upper and lower portions are generally equal, but the upper is longer in birds of prey. The edges, usually more or less sharp, sometimes (e.g. in goosander) exhibit saw-like notches not unlike teeth. In the majority of cases the bill is not sensitive, the distribution of nerves being restricted

to a wax-like patch (the *cere*) at the base of the upper part of the beak. In aquatic birds, such as ducks and snipes, which feel for their food in the mud, this sensitive skin is carried forward almost to the point; and the bill of the woodpecker is also very richly supplied with nerves. The nostrils are usually far back near the cere, but often lie farther forward, most markedly perhaps in puffins.

(b) *History*.—No living birds have teeth. With the evolution of the class these structures have been lost. The fossil birds of America (*Odontornithes*) exhibit teeth, within sockets in *Ichthyornis*, simply in grooves in *Hesperornis*. But even in these forms the characteristic bones of the upper part of the bill—the premaxillæ—were toothless, and probably insheathed in a horny beak. The primitive bird *Archæopteryx* was also provided with numerous uniform teeth. From the beginning of the Tertiary Period onwards no toothed birds are found. Traces of teeth, however, still persist. Geoffroy St Hilaire (died 1844) observed small tooth-papillæ in the embryos of certain parrots, and this observation has been repeatedly confirmed. The presence of the characteristic tooth-substance dentine has even been asserted. The tortoise tribe have also lost their teeth, and here again the presence of rudimentary teeth in embryos (*Trionyx*) proves that the toothless state is secondary. That birds get on well without teeth is evident enough, but it is difficult to give a physiological explanation of their absence. The very spongy character of bird bone, obviously inconsistent with teeth, the sharp antithesis between the skin structures of birds and those of reptiles, the disuse resulting from the developed parental care which supplies the young with food, the general nature of the nutrition, and the freedom from fighting which birds must at first have enjoyed ought probably to be taken into account; but some deeper physiological reason is still required. This is peculiarly difficult when we recall the very varied nature and habit of toothless vertebrate animals—e.g. pipe-fish, toads, turtles and tortoises, birds, duckmole, echidna, ant-eaters, and some whales.

(c) *Relation to Function*.—The bill is chiefly used in seizing and dividing the food, but also for fighting, preening, nest-building, &c. It varies most with the nature of the food. It is hardest in birds which live on fruits, seeds, and flesh; sharpest in the birds of prey; more delicate in insectivorous forms; and softest in those which pick their food out of the mud. It is shortest in the graminivorous, and longest in the marsh birds. In birds of prey the beak is hooked, and often notched; in fishing-birds it is usually very large; in those which catch flying insects the gape is particularly wide. Water birds often exhibit cross plates at the margins, between which the water taken in with the food is allowed to escape. Wallace noted an interesting correspondence between the length of a humming-bird's bill and the depth of the flower-tube which it visits. Finally, it is worth noting that beaks sometimes exhibit (e.g. in fowls and sparrows) pathological variations, which closely resemble what in other birds are the normal forms. See BIRDS.

Bill, in its general acceptation, means a formal written paper or statement of any kind; originally, it was applied to any sealed document, being derived from Lat. *bullā*, 'a seal' (Middle English, *bille*; English Law Latin, *billa*). It has a number of technical applications, for which see below; and see also PARLIAMENT; INDEMNITY; EX-CHEQUER BILLS; ATTAINDER, COSTS, HEALTH, MORTALITY, RIGHTS, VICTUALLING (BILL OF).

BILL, in the criminal law of England, is the formal name of a written accusation of serious crime preferred before a grand jury. If that body by a majority finds 'a true bill,' the prisoner or party accused is thereupon tried upon an indict-

ment before a petty jury, whose verdict determines his guilt or his innocence; but if the grand jury find 'no true bill,' the accused is at once set at liberty. In the latter event, however, other bills may be sent up against him. This whole procedure is more quickly and cheaply managed in Scotland by the system of public prosecutors, who take the responsibility of proceeding to trial without a preliminary public investigation. See GRAND JURY, INDICTMENT, PROSECUTION, TRIAL.

BILL, or BILL OF COMPLAINT, was the name given in the English Court of Chancery, prior to the Judicature Act of 1873, to the formal statement of the facts and prayer for relief submitted by a plaintiff to the court. This is now in every case a Writ of Summons (q.v.) and Statement of Claim (q.v.), and is not greatly different from a well-drawn summons and condescendence in the Scottish courts. In the United States the bill consists of the statement, the charges, the interrogatories, the prayer of relief, and the prayer of process.

BILL-BROKERS are persons who, being skilled in the money-market, the state of mercantile and personal credit, and the rates of exchange, engage, either on their own account, or on that of their employers, in the purchase and sale of foreign and inland bills of exchange, and promissory-notes. They are to be distinguished from discount-brokers, or bill-discounters, whose business consists in discounting or advancing the amount of bills of exchange and notes which have some time to run before they come due, on the faith of the credit of the parties to the bill. Thus a bill-broker might purchase a doubtful bill and discount it by means of his own credit. The distinction between them is not, however, in practice a very broad one. See BILL OF EXCHANGE (below), BROKER, PROMISSORY-NOTE.

BILL-CHAMBER is a department of the Court of Session in Scotland which deals with summary business—so called because formerly both summonses and diligence or execution were for the most part commenced by a writ called a bill. These bills went to the whole court, but the necessity for them has been in most cases abolished by the reforming legislation of the 19th century. Since 1813 the Bill-chamber is presided over by a single judge called the Lord Ordinary on the Bills, and during the sittings of the Court of Session the duty is taken by the junior or last appointed judge of the court; but in vacation-time the business of the Bill-chamber is performed by a rotation of judges.

In the few cases where bills are still in use in processes of diligence—e.g. in bills for letters of arrestment or inhibition on the dependence of an action where the will of the summons contains no warrant for that purpose—application is made in the Bill-chamber, and a *fiat* is written on the bill and signed by the clerk of the bills (Act of Sederunt, 1913, E. chap. iii.). In modern practice the main business of the Bill-chamber consists in dealing with applications for suspension of diligence, or of decrees of inferior courts, or of decrees in absence in the Court of Session, and with applications for interdict. All such proceedings were formerly instituted by bills, but now commence with notes, which, however, must still pass through the Bill-chamber. The Lord Ordinary on the Bills, on passing the note, may sist execution of the charge, or decree, or order *interim* interdict, as the case may be, pending the final decision of the case in the Court of Session. If, indeed, no appearance has been entered, and no answers lodged in the Bill-chamber, the Lord Ordinary now has power, on passing the note, to pronounce a final judgment granting the prayer of the note in whole or in part. The jurisdiction of the Bill-chamber has been

largely supplemented by statute. Thus, under the bankruptcy statutes, the Lord Ordinary on the Bills may award, refuse, or recall sequestration, and deal with many matters arising in the course of bankruptcy proceedings. Any order made in England or Ireland by a competent court in bankruptcy, or in the winding-up of a company, may be enforced in Scotland on being registered in the Bill-chamber and certified by the clerk of the bills. Again, in vacation the Bill-chamber exercises many of the powers of the Court of Session—e.g. in petitions for interim appointment of public officers, and in applications under the Judicial Factors Acts, the Trusts Acts, and other statutes. See COURT OF SESSION, INTERDICT.

BILL OF ADVENTURE is a writing by a merchant, stating that goods shipped by him, and in his name, are the property of another, whose *adventure* or chance the transaction is—the shipping merchant, on the other hand, undertaking to account to the adventurer for the produce.

BILL OF EXCEPTIONS is a statement of objections, by way of appeal, against the ruling of a judge who is trying a case with a jury in the Court of Session. The objection may be that the judge has misdirected the jury in point of law, or has improperly rejected or admitted evidence. The bill is argued before four judges, and if it is sustained a new trial is ordered. The phrase was prior to the Judicature Act also used in England in the same sense, but is now merged in the 'motion for a new trial' (see TRIAL). In the United States the phrase is used for a statement of the objections of either party to the ruling of the judge during the trial. Exceptions must be taken at the time, and must be properly certified by the court to whose rulings they are taken.

BILL OF EXCHANGE, a document purporting to be an instrument of pecuniary obligation for value received, and employed for the purpose of settling a debt in a manner convenient to the parties concerned. The original and simple purpose of a bill is to obviate the necessity of cash payments in the settlement of accounts between parties at a distance from one another. Thus, A and B are two merchants in London; and C is a merchant in Cadiz. A owes C £1000; and C owes B a like sum. Instead of A sending cash to C, and C to B, C draws a bill for £1000 upon his debtor A, and sends it on to B, who receives the amount from A; so that the transaction throughout is settled, without a farthing in money being sent from Cadiz to London, or from London to Cadiz. It is easy to see that a bill may, in a similar manner, pass through several other hands before it finally comes back to A, and is paid by him. Another simple idea of a bill is this: One person owes another £100 for goods, for which he is to have credit for three months. The creditor, however, not being able conveniently to be without the money for that length of time, gets from the debtor an obligation or bill bearing that the £100 is to be paid in three months. This bill, being a negotiable instrument, will be discounted by a banker, or other capitalist, who now stands in the position of the creditor, and receives payment when the bill is due. Thus, a bill of exchange performs two kinds of offices in commerce—it saves the transmission of coined money, and it enables creditors not only to fix down debtors to a day of payment, but to get the use of a sum equivalent to the debt (less a small discount) before it is properly due.

The origin of this important mercantile instrument is usually attributed to the Jews and Lombards, when banished from France and England in the 13th century. It is certain that hitherto no trace of such bills has been discovered either in the Roman code, or in any other system of

ancient jurisprudence. The first notice of them in modern times occurs about the middle of the 12th century, and by the end of the 14th they had got into general use in all the commercial states of Europe. In England, from about the middle of the 14th century down to the time of James I., and for many years after, bills of exchange were restricted to the purposes of foreign commerce. What are called inland bills—i.e. bills drawn by and upon persons resident in this country—were not employed much earlier than the reign of Charles II., and even then they were regarded with distrust and jealousy by the English judges. Another restriction upon bills of exchange was, that the privilege of their use was confined to merchants. But all restraints on such instruments gradually yielded to the wants and conveniences of society, and now any one capable of making a contract can be a party to a bill transaction, without regard to position, calling, or occupation. In Scotland inland bills were put on the same footing with foreign bills by an act of the Scottish parliament passed in 1696. Numerous enactments were passed from time to time, until in 1882 a measure became law, known as the Bills of Exchange Act, 1882 (45 and 46 Vict. chap. 61), which was intended to codify the existing law relating to bills of exchange, cheques, and promissory-notes. Besides doing this, the act introduces certain changes into the existing law, and in particular it assimilates in nearly every respect the laws of the three kingdoms in regard to bills or notes. Differences still exist in the following points: A bill does not in England, as it does in Scotland, operate as an assignation in favour of the holder of a debt due by the drawee to the drawer; the act does not alter the former rules as to bankruptcy in Scotland, nor in regard to the sexennial prescription or limitation, and the summary methods of enforcing payment, which continue to differ to some extent in each country; and in Scotland consideration is not required to support a bill as it is for simple contracts in England. The laws relating to bills in the United States, and in the various British colonies, are similar to the English law.

A bill of exchange is defined to be a written and unconditional order, addressed by a person who is called the drawer, to another person called the drawee, desiring him to pay a certain sum of money to a specified person, or his order, or to bearer, within a certain time after its date, or after it is presented for payment, or on demand. If the drawee signs the bill in token of his agreeing to this request, he is called the acceptor. A *Promissory-note* (q.v.), though differing in form, is in all essentials equivalent to a bill. It is, in fact, simply a bill in which the drawer and the acceptor are identical. A bank-note is a promissory-note issued by a banker, payable to bearer on demand, and a bank *cheque* is a bill of exchange drawn on a banker. Subject to certain special provisions they are regulated by the same rules as other bills. For the constitution of the bill itself no particular form of words is necessary, provided its characteristic qualities clearly appear on the face of it, as a pecuniary instrument and an unqualified order. A bill of exchange is only good for a certain sum in money; such an instrument for the delivery of *goods* or property other than money would not be a bill. But although no particular words are required in a bill or note, it is always advisable to adhere, as much as possible, to their customary form. The only restrictions in regard to amount are that no bills or notes can be issued or negotiated in Scotland for less than 20s. (8 and 9 Vict. chap. 38), and that notes for less than £5, payable to bearer on demand, cannot be issued in England, nor, except by bankers, in Scotland or Ireland.

Besides the other requisites mentioned, bills of exchange must be duly *stamped*. The regulations on this subject are contained in the Stamp Act, 1891, and are to be found in almanacs and other publications in common use. The omission of the stamp, or using a stamp of insufficient amount, cannot be subsequently rectified; the bill is altogether void, and the parties to it are liable to a penalty of £10. A bill payable on demand, however, which is only liable to a stamp-duty of two-pence, may be stamped with an adhesive stamp subsequent to its issue, but the above penalties are still enforceable. The duties on bills drawn out of the United Kingdom are denoted by adhesive stamps, to be affixed by the holder of the bill before negotiating it.

The following is the usual form of an inland bill of exchange (for foreign bills, see below):

£100.

LONDON, 2d January 19—.

(Stamp.) Two months after date [or 'at sight,' or 'on demand,' or 'at — days after sight'], pay to Mr E. F., or order [or 'to me, or order,' or 'to bearer'], One Hundred Pounds, for value received. A. B.

To Mr C. D., Merchant, Bristol.

From this form it will be seen that there are usually three parties to a bill of exchange, these three being: (1) the *drawer* (A. B.); (2) the *acceptor* or *drawee* (C. D.), to whom the order is addressed; and (3) the *payee*, or party in whose favour the bill is drawn, and who is entitled to receive the contents (E. F.). The transaction, however, may be simply between the drawer and acceptor, without the interposition of a third party; and there are other modifications and changes of form, according to the circumstances of the case, and the mode in which it is desired to have the bill negotiated. The bill, being thus in proper form, and duly authenticated, is then presented for acceptance, which may be defined to be the act by which the drawee evinces his consent to comply with, and be bound by, the request contained in the bill of exchange directed to him; or, in other words, it is an engagement to pay in money the bill when due. Acceptance in the case both of inland and foreign bills of exchange must now be in writing on the bill, and signed by the acceptor, or some person duly authorised by him; the mere signature of the drawee, without any additional words, being sufficient. There are certain precautions to be observed before accepting. The drawee should, upon presentment for acceptance, and before he accepts, assure himself that the signature of the drawer is genuine, and that there has not been a fraudulent substitution of a larger sum than that originally inserted in the bill by the drawer. And if the drawee accept a forged bill, or a bill for a larger amount than that originally named by the drawer, he will nevertheless be liable to pay a *bonâ fide* holder. There is also acceptance *supra protest*, which takes place where, after a bill has been protested for non-acceptance, but not before, any person, not already liable on the bill, may accept it *supra protest*, which acceptance is so called from the manner in which it is made. Where the drawee of a foreign bill cannot be found, or is not capable of making a contract, or refuses to accept, this description of acceptance is frequently made in order to save the credit of all or some of the parties to the bill, and prevent legal proceedings. In this country it is called an acceptance for the honour of the person or persons for whose use it is made, and in France an acceptance *par intervention*. The drawer or indorser of a bill may insert in it the name of a person to whom the holder may resort in case of its non-acceptance. In place of simply assenting to the order, the drawee may *qualify* his acceptance by making payment dependent on

the fulfilment of a condition, as 'the delivery of bills of lading.' An acceptance may also be qualified as to the amount or currency of the bill or the place where it is payable. An acceptance 'payable at Coutts' Bank' would be general, but 'payable at Coutts' Bank only' would be a qualified acceptance. It must be observed that while the acceptance or indorsement may be qualified, the bill itself as drawn must be an unconditional order.

The bill as a negotiable instrument, being thus complete in all its parts, may either be held by the drawer or other payee till due, when it is presented for payment to the acceptor, or it may at once be transferred by *Indorsement* (q.v.), the indorsee taking it for its value at maturity, and in the meantime cashing or discounting it to the holder. There may be a succession of indorsees, the last of whom is entitled to payment; and to him all the other indorsees, as well as the drawee and drawer, are bound. Like the acceptance, the indorsement may be qualified or conditional, and it may also be *restrictive*, as 'pay A. B. only,' thus prohibiting the further negotiation of the bill. An indorser may also add the words 'without recourse,' so as to negative his own responsibility to the holder. This method of disposing of bills without a concurrent obligation by indorsement is better known and more practised in the United States than in England. Instead of discounting his bills in the usual form through a banker, a merchant in New York will sell his bills to a broker or dealer in this kind of instrument, the price paid being according to the state of the money-market and the creditworthiness of the acceptor. In such cases the purchaser stands in the place of the drawer, undertakes all risks, and as custodian of the bill has the power of legally exacting payment.

When the bill arrives at maturity—that is, on the day when its payment is due—it must be presented for payment to the acceptor at the place or address mentioned in the bill; if none is mentioned, then at his place of business or residence. If the holder fail to duly present, the drawer and indorsers will be relieved of liability; even the known death or bankruptcy of the acceptor will not excuse presentment for payment. It may, however, be dispensed with if the acceptor is a fictitious person or is not bound to pay the bill, if the parties expressly waive presentment, or if, after reasonable diligence, the acceptor cannot be found.

When the bill is not payable on demand or at sight, three days of grace are added to the currency of the bill, on the last of which the bill becomes payable. Should the last day of grace fall on a common-law holiday, as Sunday, Christmas-day, or Good Friday, or a National Fast or Thanksgiving Day, the bill is payable on the preceding day; but if the last day of grace is an ordinary statutory bank holiday, the bill is due on the succeeding business day. If the acceptor is unable to pay, he may endeavour to arrange for a *renewal* of the bill—i.e. the drawing of a new bill with an extended currency. Failing such an arrangement, if the bill is not paid on presentment, the holder must give immediate notice of its dishonour to the drawer and indorser, from whom he can then claim payment. To preserve this recourse, it is not necessary to note or protest the bill, this act being now necessary only in the case of foreign bills, and, in the case of inland bills, as a preliminary to acceptance or payment for honour, or to preserve the right of summary diligence in Scotland. The acceptor, as primary obligant, may then be proceeded against in a very speedy form in England under the 'Summary Procedure Act, 1885,' and in

Scotland by the still more direct method of summary diligence, without further action, under the old statutes of 1681 and 1696.

By the Statute of Limitations (see *LIMITATION*) in England, and Prescription (q.v.) in Scotland, bills and notes (except bank-notes) become of no effect in six years after their due date, but the creditor may still recover on the original claim in satisfaction of which he received the bill.

Accommodation Bill.—A bill in its legitimate sense is a document constituting a debt, and as such is beneficial to all parties connected with its negotiation. A owes B £100. A cannot conveniently pay the amount, while B is in need of it; B draws on A, and C (a banker) discounts—i.e. for a consideration pays the amount to B. B thus gets his money at once, A obtains time, while C makes a profit for advancing. These facilities have had the effect of inducing bills to be resorted to for raising money where no value is given, and in which one party gives the use of his name for the *accommodation* of another. In the above case, for example, let us suppose that A does not owe B, but yet accepts B's draft. If C discounts the bill, it is immaterial whether he knows that A has got value or not—as an onerous holder, he can compel payment from A if B cannot pay the bill. But if merely in B's hands, the amount is not recoverable from A if the latter can prove that no value was received by him. *Accommodation* bills, being a simple and easy way of raising money on credit, often give rise to fraud and rash speculation, and many attempts have been made to suppress the system; but it is difficult to do so without unduly interfering with the negotiation of *bona fide* bills.

Foreign Bill of Exchange is a bill which is either both drawn and accepted abroad; or drawn by a person residing abroad on a person in this country, or the reverse. The risk of miscarriage to which these bills are liable in their transmission to distant countries has given rise to the custom of drawing them *in sets*—that is, writing out two or three of the same form and tenor, and transmitting them to the payee by different channels, so that if one or two of the individuals of any set are lost, the other might reach its destination. The first of the set that is presented and accepted is alone entitled to payment, and payment of it discharges the acceptor; but foreign bills, of course, may also be drawn singly. The following is the usual form of a foreign bill:

£1000.

JAMAICA, 2d January 19—.

Fifty days after date pay this First of Exchange (second and third of same time and date unpaid) to the order of A. B., One Thousand Pounds sterling, value received.

C. D.

To E. F., London.

If a bill be drawn in this country upon a correspondent abroad, or a foreign house, it must be stamped; and when drawn abroad it must be stamped by the holder, before he can present it for payment, or indorse, transfer, or otherwise negotiate it within the United Kingdom (Stamp Act, 1891, sect. 35). Formerly a bill drawn or payable in Scotland or Ireland was foreign in England; but such bills are now inland, and the same regulation extends to the islands of Man, Guernsey, Jersey, Alderney, Sark, and adjacent islands (Bills of Exchange Act, 1882, sect. 4). The same act, sect. 72, provides that the liabilities of the drawer, the acceptor, and indorser shall be governed by the laws of the countries in which the drawing, acceptance, and indorsement respectively took place. The duties of a holder are determined by the law of the place where the act is to be done, and the due date depends on the law of the place where the bill is payable. Thus, a bill drawn in Paris or

Berlin on London is entitled to three days of grace, but a bill drawn in London on either of these places has no days of grace, these not being recognised by the laws of France or Germany. If a foreign bill is dishonoured by non-acceptance or non-payment, it must be duly protested, or the drawer and indorsers are discharged. In the case of foreign notes protest is not necessary, but it is always advisable if the makers of the note are to be sued abroad, as the law of the foreign country may require protest. Except in a few points, the laws of most commercial countries agree with those of the United Kingdom in regard to bills. See treatises on Bills of Exchange by Byles (16th ed. 1899), Hamilton (1904), and Chalmers (6th ed. 1902).

BILL OF LADING is a receipt from the master of the vessel to the shipper (usually termed the *consignor*), undertaking to deliver the goods—on payment of freight—to some person whose name is therein expressed, or indorsed thereon by the consignor; and the delivery of this instrument— independently of the actual delivery of the goods— will suffice to transfer to the party so named (usually termed the *consignee*), or to any other person whose name he may think fit to indorse thereon, the property in such goods; and by the Bills of Lading Act, 1855, it is provided that every consignee and every indorsee shall have transferred to him all rights of suit, and be subject to the same liabilities in respect of the goods as if the contract had been made with himself. The bill of lading is a document of title to the goods, and the indorsement and delivery of it to a *bonâ fide* transferee for value defeats the lien of the unpaid vendor of the goods, and his right to stop the goods *in transitu*. A bill of lading is conclusive evidence of the shipment made as against the master or other person signing it. Bills of lading are thus the proper evidence of the contracts of a 'general ship'—i.e. where the ship is not chartered wholly to one person, or where the charterer takes sub-freights. They are made out in three copies, one of which is retained by the shipper, another sent to the consignee, another left with the master. A 'mate's receipt' is generally given until the more formal bill of lading is made out. The bill mentions the name of the master, the destination of the ship, the goods, the consignee, and the rate of freight (see also the article **SALE**). A bill of lading thus fulfils three functions: (1) it is a receipt for the goods shipped under it; (2) it constitutes the contract for the carriage of the goods; (3) it is a negotiable document of title to the goods.

In the United States, an act making uniform the law of bills of lading has been passed in New York and several other states.

BILL OF SALE, in the law of England, in modern usage is a document whereby a sale or mortgage of personal chattels is effected, without an actual transfer of the possession of the chattels to the purchaser or mortgagee. Documents of this kind, assigning goods without delivery to the assignee, are (subject to certain exceptions) within the scope of, and regulated by, the statutes known as the Bills of Sale Acts. The main purpose of these acts is, by means of a system of compulsory registration, to prevent false credit being given to persons who remain in possession of goods after parting with the ownership. The acts apply only to bills of sale of 'personal chattels,' a term which includes goods, furniture, and other articles capable of transfer and delivery, as well as growing crops, when assigned separately from the land, and trade machinery. Certain assignments of book debts, however, are now, under the Bankruptcy Act, 1913 (sect. 14), required to be registered like bills of sale. Bills of sale, within the meaning of the

Bills of Sale Acts, are of two kinds: (1) absolute, such as are executed with the intention of conferring absolute ownership on a purchaser; (2) those granted by way of security for the payment of money. Absolute bills of sale are comparatively rare; but bills of sale used as a means of creating a right in security over goods are of great importance in the business life of England.

Bills of sale granted by way of security are now required to be in accordance with the form prescribed in the schedule to the Bills of Sale Act, 1882 (45 and 46 Vict. chap. 43), otherwise they are altogether void. The prescribed form plainly expresses the nature of the contract as to the loan and the security for the loan; and the policy of the legislature in prescribing this form is to prevent needy persons being entrapped into signing documents of charge which they do not fully understand, and which might be made instruments of oppression. The other chief statutory requisites in the case of a bill of sale by way of security are that it must be attested by one or more credible witnesses; that it must contain a true statement of the consideration, which must not be less than £30; and that it must be registered within seven days of its execution. To the registrar must be presented a true copy of the bill, of every schedule or inventory annexed to it, and of every attestation of its execution. An affidavit must be filed at the same time verifying the date, the due execution, and the attestation of the bill, and stating the names, addresses, and occupations of the grantor and of every attesting witness. When the goods covered by the bill of sale are seized or taken possession of, they must not be removed or sold for five days; and during that period the grantor of the bill of sale may apply to the court to restrain the removal or sale of the goods. The priority of bills of sale is determined by the date of registration. The registration must be renewed every five years.

The Bills of Sale Acts do not extend to Scotland or Ireland. For Ireland, however, acts have been passed modelled on the English statutes. In Scots law, on the other hand, a real right over movable goods, whether absolute or by way of security, cannot, as a general rule, be effectually constituted unless the possession of the goods is transferred.

The expression bill of sale, in the Bills of Sale Acts, does not include transfers or assignments of any ship or share of a ship. But the document of title used in England and Scotland for passing the property in, or mortgaging, a ship, under the Merchant Shipping Act, 1894, is known as a 'bill of sale.'

In the United States the effect of a bill of sale is to transfer the property in the thing sold. By Act of Congress (R.S.U.S., sect. 4170) every sale or transfer of a registered ship to a citizen of the United States must be accompanied by a bill of sale setting forth the certificate of registry.

BILL OF SIGHT is an entry of imported goods of which the merchant does not know the quantity or quality. This is permitted to save time by the Customs authorities on sworn information. The bill must be made perfect in three days by indorsing the particulars required for warehousing, payment of duty, or delivery free of duty. If the entry is not completed within a month, the goods are sold.

BILL OF STORE is a licence from the Customs authorities to reimport into the United Kingdom dutiable British goods formerly exported. Goods included in the bill are not regarded as foreign goods, and therefore are not liable to customs duties. The goods must in all cases have been reimported within five years from the time of exportation.

Billardiera, or **APPLEBERRY**, a genus of

twining Australian evergreen shrubs of the natural order Pittosporaceæ. The fruit is generally bluish when ripe, and is eatable, although not destitute of a resinous character which prevails in the order. Some species are cultivated in greenhouses in Britain.

Billet, in Architecture, an ornament belonging to the Norman style. It was formed by cutting a moulding—generally a round moulding—into notches, so that the parts left resembled billets of wood. When used in several rows, the billets and



empty spaces are placed interchangeably, as in the accompanying illustration.

Billet, FELIX (1808–82), physicist, born at Fismes (dept. Marne), who became professor at Dijon in 1845. He wrote on the change in volume in solids becoming liquid, on electric condensation, and on optics (the ‘demi-lentilles’ or ‘bi-lentilles of Billet’ being famous).

Billeting, or CANTONING, is a mode of lodging soldiers and their horses by quartering them on the inhabitants. Billets are of three kinds—(1) with full subsistence; (2) with partial subsistence; (3) without subsistence. In the first two cases officers and others must be satisfied with the usual fare of the householder, unless a special scale has been laid down, and neither bedding nor furniture can be demanded as a right; but ‘attendance’ can be required, and the use of cooking utensils. Billeting is a convenient method of utilising local resources, for by this means not only shelter but food may be provided with the minimum of trouble, and the food-supplies in the army transport conserved for emergencies. The regulations lay down that ‘as a rule no payment will be made in respect of billets without subsistence.’ The prices to be paid for food, forage, and accommodation are fixed for each year by the Army Annual Act (see ARMY ACT), but in this country a much more liberal payment is actually made, including rent for billets without subsistence. Consequently the former unpopularity of the billeting system has greatly diminished, this being also partly due to the better behaviour of modern troops. The civil population naturally resented billeting, and one of the provisions of the Petition of Right (1628) was directed against the practice. The Mutiny Act, passed for the first time in 1689, declared that no housekeepers should be compelled to accommodate soldiers except on a recognised and fairly administered system. The chief civil magistrate of a town, on requisition from the military authorities, quartered the soldiers on the inhabitants as fairly as he could. This continued in England until 1745, when the liability to provide billets was limited to certain traders, and has so continued ever since; but the alteration was not made in Scotland until 1857.

The various Army Acts provide that only the keepers of public-houses of any description, if licensed to sell beer, wine, or cider to be drunk on the premises, are liable to have soldiers billeted on them, and livery-stable keepers to take in troop horses. The exceptions are canteens, and houses kept by foreign consuls or Vintners of the city of London. In 1909 extension was made to ‘public buildings, dwelling-houses, warehouses, barns, and stables’ on embodiment of the Territorial Force. The cases in which billeting is resorted to in the United Kingdom are either when troops are called

out in aid of the civil power, or when mounted troops are marching for several days, or when the Territorial Force is embodied; but whenever practicable they would be lodged in barracks, and dismounted troops are always moved by rail or sea for any distance exceeding one day’s march. The order for the march is the authority for drawing billets. It is issued by the Secretary of State for War, and specifies the exact number of men and horses for which billets may be drawn, and the dates on which they are to be at each town. This document is called a ‘route.’ A billeting party of an officer, a sergeant, and one private per company precedes the main body by one day’s march, and presents the ‘route’ to the billet-master (usually the chief constable) at the first halting-place, and communicates with the local health official. This official has a list of persons liable to have soldiers billeted on them, and from it he selects those whose turn it is to take them. The men and horses are told off to their billets by the billeting party in order that no delay may arise when the main body enters. After its arrival, the soldiers go to the houses on which they are billeted, all those belonging to one troop being quartered as near together as may be, for convenience of muster, and the horses near the men. The licensed victualler or householder is bound to provide each billet-holder with food, drink, and accommodation, either in his own house or somewhere at hand, and the livery-stable keeper has to provide straw, hay, and oats of good quality for each horse. The officers visit the houses, to see that the men really have one hot meal per day, instead of taking the value of it in money. The soldier may demand facilities for cleaning his arms and accoutrements. Accounts are paid by the Army Pay Department. Officers pay for their own food. Disputes often arise between the innkeeper or others and the officers of the regiment, and there are provisions of the Army Act framed to prevent irregularities on either side, but especially to safeguard the rights of the civilian.

In the United States a provision of the constitution specifies that no soldier shall in time of peace be quartered in any house without the consent of the owner, nor in time of war but in a manner to be prescribed by law.

Billiards (from old Fr. *billard*, ‘a stick with a curved end,’ ‘a cue,’ in English, introduced as the name of a game, and made plural). The origin of billiards is uncertain. The historian who plunges deepest into the mystery of the past is the author of *Modern Billiards*, the American textbook of the game, who refers to the travels of Anacharsis through Greece, 400 B.C., during which a game which might have been early billiards was seen; and also tells how Cathira Mora, king of Ireland, who died 148 A.D., left ‘fifty billiard-balls of brass, with the pools and cues of the same material.’ Others ascribe the invention of the game to Henrique Devigne, an artist who flourished about 1570. It was brought into fashion by Louis XIV. (middle of 17th century), whose physicians recommended him exercise after meals. Another party believe billiards to be of English origin, and it is mentioned by Spenser (*Mother Hubbard’s Tale*, 1591) and by Shakespeare (*Antony and Cleopatra*, circa 1607). The earliest description of billiards in English is in Cotton’s *Complieat Gamester* (1674). The bed of the table was then made of oak, or occasionally of marble. Slate beds were first used about 1827. The cushions were stuffed with flock: list was used later. India-rubber cushions were first manufactured about 1835. The pockets, called hazards, were at first wooden boxes, nets being employed soon afterwards. Each player pushed his ball with a mace made of heavy wood, and tipped at the broad end

with ivory. The game played was the white winning game (single pool), five or three up. A player holing his adversary's ball won an end (or life); if he holed his own ball he lost a life (hence the terms winning and losing hazards). In addition, a small arch of ivory, called a 'port,' and an ivory peg or 'king,' stood on the table, and certain scores appertained to passing the port and to touching the king.

In 1734 French billiards first appears in Seymour's *Court Gamester*. It is there stated that port and king are now wholly laid aside. Maces were still commonly used, but cue-playing was permitted. Cues, however, had no tips until the beginning of the 19th century. French billiards was very like single pool, a hazard counting two, a miss one, and a coup three. The game was played twelve up.

The losing game, in which a player scored for a losing hazard, was also occasionally played. About 1775 the carambole game (abbreviated to carom) is first heard of. A third ball, called the carom ball, was introduced. Winning hazards and cannons counted to the striker, losing hazards against him; and a baulk (now first so called) compelled the next striker to play out of baulk, as at present. Early in the 19th century the white winning and losing carambole game, now known as billiards, ousted all other varieties in this country. It is played on a table, the bed of which must measure 12 feet by 6 feet $1\frac{1}{2}$ inches, and is covered with a cloth, the nap of which shall run from the bottom to the top cushion. The cushions, which are now invariably made of rubber, are covered with cloth similarly to the bed, and no part of the cushion-rails may extend more than 2 inches or less than $1\frac{1}{2}$ inches beyond the edge of the bed. The cushions on the shorter sides of the table are known respectively as the top and bottom cushions, according to the run of the cloth. The distance from the floor to the top of the cushion-rail must not be less than 2 feet $9\frac{1}{2}$ inches, nor more than 2 feet $10\frac{1}{2}$ inches. The table shall be fitted with six pockets, one at each corner, and one pocket in each of the longer sides equidistant from the top and bottom cushions. The openings of the pockets shall be in accordance with the registered templates of the Billiards Association and Control Council, and those of the corner pockets measure a shade less than 3½ inches at the fall of the slate. Three balls, each of which must not be less than $2\frac{1}{8}$ inches nor more than $2\frac{3}{8}$ inches in diameter, are used. These balls may be manufactured of any substance, but, practically, there are only three kinds in use—ivory, bonzoline, and crystallate. The two last-named have certain decided advantages over ivory, being less than half the price, and being unaffected by extremes of heat and cold, as well as being capable of standing a vast amount of rough usage; but, after contact with another ball, they come off at a more acute angle (especially so in the case of bonzoline) than that thrown by ivory balls, and lack the delightful 'life' of the natural product.

The French have long discarded pockets altogether, and play only a cannon game, with larger balls and a smaller table. The Americans added a fourth ball, and in their game cannons and winning hazards counted to the striker, and losing hazards against him. They then abolished the two side-pockets, in consequence of their interfering with cannon play (or, as the Americans still spell it, more correctly, carom). Of late years pocket-tables have been but little used in America, except for pool; and the size of the table has been gradually reduced to 10 feet by 5 feet; balls $2\frac{3}{8}$ inches in diameter. The four-ball game is now seldom played by experts, the three-ball French carom game having superseded it in match play. The skill

exhibited by the players has improved to such a remarkable extent that when Frank Ives challenged Jacob Schaeffer for the championship about 1892 it was agreed that the baulk-line should be drawn 18 inches from each cushion. These lines formed eight compartments, and, whilst all three balls were in each of these, only one carom was permissible. It was to minimise the effects of this 18-inch baulk-line that Ives invented what he termed the 'anchor' stroke, a name which was afterwards incorrectly given to the 'perpetual' cannon, by means of which Cook, Reece, Lovejoy, and other English professionals ran up such gigantic breaks. The first-named made the record of 42,746, and the game was reduced to such a farce that the Association was compelled to step in and introduce a new rule that not more than twenty-five consecutive ball-to-ball cannons should be allowed.

In 1825 John Carr was accepted as the first acknowledged champion of English billiards, but the title was never played for until 1870, when William Cook, senior, defeated John Roberts, senior, who assumed the title when Edwin Kentfield refused to play him in 1849. The championship has, subsequent to the first match in 1870, been held by John Roberts, junior, Joseph Bennett, W. J. Peall, C. Dawson, H. W. Stevenson, Melbourne Inman, W. Smith, and T. Newman. The last-named secured the title in 1922, and is probably the greatest player of them all, though it must be admitted that he possessed the great advantage of having the full benefit of the experience of his predecessors, and of all the improvements which have been made in the tables. There was no generally recognised code of rules for the game until the Billiards Association was formed in 1885, the committee of that body being composed of amateurs and professionals. This was a grave initial mistake, for in no other game or sport are professionals allowed to have a part in the management, but it was more than twenty years later before this very necessary alteration was made. In 1908 the Billiards Control Club came into existence, which made the state of affairs worse than ever, for the professionals were playing under the new code of rules, and the great bulk of amateurs under the other. This was the worst thing that could possibly have happened in the interests of the game, and an amalgamation of the two bodies took place in 1919. The new body was termed the Billiards Association and Control Club, Lord Lonsdale being elected president, whilst Mr Sydenham Dixon, who was president of the Billiards Association from 1906 to the date of its dissolution, was the chairman. Practically all the governing bodies of billiards all over the world became affiliated to the Billiards Association and Control Club of Great Britain, and the greatest of indoor games was at last placed upon a thoroughly sound footing.

No one has ever yet learnt to play a really fine game from a book, a series of lessons from an experienced teacher being an absolute necessity; but time or expense is saved if a beginner has a correct knowledge of the rudiments of the art when he takes his first lesson. Too much importance can scarcely be attached to the way in which a player stands at the table. The feet must be planted very firmly, for unless the body is perfectly firm an accurate delivery of the cue is impossible. The knees should be bent as little as possible, and the upper part of the body should be thrown well forward, for the nearer the eyes are brought to the line of sight the more likely is the stroke to be accurate. The arm of the bridge-hand should be extended to its full length, and should bear sufficiently on the table to ensure a steady position. The chief support of the bridge itself is the ball of

the thumb, which should be pressed firmly to the table. The tips of the fingers should grip the table, and all of them should be kept slightly apart, the distance between the third and little fingers being greater than that between the others. The thumb should be closed tightly against the hand, and the first joint of it should form the chief support of the cue. The arm which wields the cue should be kept as close to the body as is consistent with freedom of leverage, and the forearm should be perpendicularly above the cue. In making the great majority of strokes the cue must be held with the tips of the fingers and thumb. Whether you use all your fingers, or one, two, or three of them, is of no consequence, and you may do whatever comes most naturally to you in this respect, but the cue must be held as loosely as possible.

In striking the ball the cue must be kept as horizontal as possible, and there should be about 8 or 9 inches of cue in front of the bridge. Having taken careful aim—by placing the point of the cue in the closest possible proximity to the ball without actually touching it—draw the cue briskly backwards and forwards, *not more than half-a-dozen times*, and make the stroke without further hesitation. Having thoroughly mastered these preliminaries, the novice should engage the services of a reliable tutor.

See works by Jos. Bennett (1876); Wm. Cook (1866; new ed. 1877); Collender (New York, 1881); Garnier (New York, 1880); Drayson (1889); Broadfoot and others ('Badminton' series, 1896); C. D. Locock, *Side and Screw* (1901); John Roberts, jun. (1901); J. P. Mannoek, *Billiards Expounded* (1904), infinitely the best book on the game which has yet appeared; C. Dawson (1904); Hemming, *Billiards Mathematically Treated* (2d ed. 1905); and Charles Roberts, *The Complete Billiard Player* (1911).

Billings, JOSH, the pseudonym under which Henry W. Shaw (1818–85), a land-agent at Poughkeepsie, New York, published facetious almanacs and collections of witticisms, the wit in which, however, was mainly due to their deliberate mis-spelling.

Billings, ROBERT WILLIAM, born in London in 1813, acquired, during a seven years' apprenticeship with John Britton, topographical draughtsman, a taste for and facility in the production of illustrations of historic buildings. Between 1838 and 1846 he produced illustrations on his own account of several churches and cathedrals, including his *Architectural Antiquities of the County of Durham*. The work, however, with which his name is permanently associated is his *Baronial and Ecclesiastical Antiquities of Scotland* (4 vols. 1845–52), with accompanying letterpress to its 240 illustrations. He wrote several works on architecture, and conducted a large business; amongst the buildings restored under his direction are the chapel of Edinburgh Castle and the Douglas Room in Stirling Castle, &c. He died 14th November 1874.

Billingsgate, a gate, wharf, and fish-market, a little below London Bridge, to the west of the custom-house. It was opened in 1558 as a landing-place for provisions; and in 1699 was made 'a free and open market for all sorts of fish.' The present handsome stone building was finished in 1874. The unpolished phraseology native, though not peculiar, to this quarter of London, has given rise to the proverbial use of the name.

Billington, ELIZABETH, a celebrated singer, was born in London about 1768. Trained by her father, a German musician named Weichsel, she appeared as an infant pianist in 1774; and in 1783, after a secret marriage with her singing-master, James Billington, she came out with brilliant success on the opera stage in Dublin. Returning to London in 1786, she was engaged at Covent

Garden at the then unheard-of salary of £1000 for the season. She appeared subsequently in Naples, Venice, Florence, and elsewhere, with the greatest applause. In 1799, her first husband being dead, she married a Frenchman, Felissent, but owing to ill-treatment she left him and returned to London, 1801, where she received nearly £4000 for six months, playing alternately at Covent Garden and Drury Lane. She retired from the stage in 1811, and died (1818) at her villa near Venice, not without suspicion of foul play from her husband. To a voice of great compass and the richest tone, trained in all the art of the Italian school, she added a fascinating personal beauty and grace.

Billiton, or BLITONG, an island in the Dutch East Indies, between the SE. of Banca and the SW. of Borneo. It is of round shape, about 50 miles in length by 45 broad, and 1855 sq. m. in area. To the north, which is hilly, the highest point rises 3000 feet. It is rich in iron, tin, and timber, and exports rice, trepang, edible birds' nests, seaweed, tortoise-shell, and wax. Its coasts are beset with rocks and islets. The best harbour is at Tandjong; Pandang is the chief town. Pop. 36,200, of whom over 100 are Europeans, and 10,000 Chinese, the rest mostly Malays.

Billem, a decayed town of Auvergne, in the French department of Puy-de-Dôme, 14 miles ESE. of Clermont. It was the seat of a university from 1455 to 1554. Pop. 3000.

Billon, a name (originally French) for a mixed metal sometimes used in coinage, consisting of gold or silver, with a large proportion of baser metal. For some small French coins, a mixture of four parts of copper to one of silver was used before 1810.

Bilma, in the French Sahara (18° 50' N. lat., 13° 30' E. long.), on the Kavar oasis, is included in the Niger Military Territory. Capital of the Tibu country (mostly in the Chad Colony), it is a resting-place of caravans crossing the desert.

Bilney, THOMAS, martyr, born about 1495, probably at Norwich, studied at Trinity Hall, Cambridge, and was ordained in 1519. He was opposed to the formal 'good works' of the schoolmen, and denounced saint and relic worship; and to these mild Protestant views he converted Hugh Latimer and other young Cambridge men. In 1527 he was arraigned before Wolsey, and on recanting, absolved, but was confined in the Tower for over a year. Stung by remorse, after two years of suffering, he began to preach in the fields of Norfolk, but was soon apprehended and condemned; and although allowed to receive the sacraments of the church from which he differed so little, he was burned as a heretic at Norwich, 19th August 1531.

Bilston, a town in South Staffordshire, situated on a rising-ground, about 2½ miles SE. of Wolverhampton, and forming part of its parliamentary borough. It has extensive iron and coal mines, iron-smelting works, iron-foundries for making machinery, besides works for manufacturing tinplate goods, japanned and enamelled wares, nails, wire, screws, and coarse pottery. It is the centre, indeed, of the hardware trade, and consequently a very busy place. Fine sand, adapted for metal-casting, is found here. Pop. 28,000.

Biluchistan. See BELUCHISTAN.

Bima, a seaport of Sumbawa, one of the Sunda Isles, and capital of a state of the same name, is on a bay of the north coast, 100 miles E. of Sumbawa.

Bimana (Lat., 'two-handed'), a term first employed by the Göttingen anatomist Blumenbach (1752–1840) to describe the human species in con-

trast to other mammals. The separate order thus designated was recognised by Cuvier (1749-1832), and by most of his contemporaries and immediate successors. But in 1863 Huxley pointed out in his work entitled *Man's Place in Nature*, that as far as the term *Bimana* was concerned, it was equally deserved by some of the higher apes. In ordinary civilised man it is indeed obvious that the foot does not grasp in the way the hand does, but this is largely a matter of use and disuse. Many men in all races have learned to use their big toes as if they were thumbs, even to the extent, in more than one case, of playing on the violin; in less civilised races, the foot is not unfrequently used in rowing, climbing, and handiwork; and our own schoolboys and sailors exhibit considerable power of foot-grip. Haeckel notes how a young infant can grasp a spoon with the big toe as with a thumb. In short, man is four-handed if he chooses. The title is now rarely used, and man and monkeys are zoologically united in the old Linnæan order—Primates. See MONKEYS.

Bimbia, a district on the southern slope of the Cameroon Mountains in Africa, and on the northern bank of the river Bimbia. Part of German Cameroons (q.v.), it came under British mandate.

Bimetallism is the name given to a monetary system in which both gold and silver are on precisely the same footing as regards mintage and legal tender. At present, in the United Kingdom, gold to any amount can be brought to the mint and coined into sovereigns free of charge, and the legal definition of the pound sterling is a certain weight of gold of a certain fineness, &c.; and gold, and Bank of England notes representing gold, are the sole legal tender to any extent.

The silver coins of this country are at present only 'token' coins. The value of the silver of which they are made (even at the valuation before any depreciation of silver relatively to gold occurred) is below the nominal value—i.e. the silver in twenty shillings (reckoning silver as worth about 60 pence, or a quarter of a sovereign, an ounce) is not worth the gold in a sovereign. As a consequence the silver is coined only in limited quantities, and is legal tender only to the extent of forty shillings. This preliminary explanation is necessary, because it is often said in a loose inaccurate way that bimetalism exists *de facto* everywhere, because all nations use both gold and silver for coinage.

There is, however, a fundamental difference between standard coin and token coin. If by great discoveries of gold, or by the opening up of hoards in the East under civilising influences, the amount of gold brought to the mints were increased to a great extent, then there would follow a general rise in prices. This depends upon the principle that, other things remaining the same, an increase in the quantity of money will raise general prices. The only object of converting the gold into coins is to use the coins to spend, and the increase in spending power tends to force up prices. The theory is confirmed by the effects of the great discoveries of gold in Australia and California about 1850. Similarly, in the 16th century, when silver was standard money, the discovery of the rich mines of Potosi caused a great rise in prices.

But if under present conditions, in which no civilised nation coins silver to an unlimited extent, there were similar discoveries of silver, there would be no corresponding effect on prices. The only effect would be that silver would, reckoned in gold, become cheap or depreciated. The coinage, however, would not be increased, because the use of silver is strictly limited. If silver were a standard coin, then it would be coined in unlimited amounts, and when expended would tend to raise the prices of

commodities. The principle may be expressed thus: The quantity of standard money, other things remaining the same, determines the general level of prices, but the quantity of token money issued is determined by the general level of prices. When prices are high, *ceteris paribus*, more token money will be required as a circulating medium than when prices are low.

If we consider any particular country, the principal difficulty in the adoption of both metals as a joint standard is generally expressed by saying that the joint standard or double standard (to use the more familiar but less accurate term) would be in reality a fluctuating single standard. It is argued that, considering the variations in supply and demand of the two metals, variations must constantly occur in the relative market values of gold and silver considered as bullion. At the same time, it is said, if both are coined in unlimited amounts for unlimited payments, some definite legal ratio must be adopted at which they are to be coined and to circulate. If a contract for so many pounds can be fulfilled by the payment of either gold or silver, it must be assumed that in some way the equivalent amounts are determined.

But suppose, when large amounts have been issued at one legal ratio, the ratio for example at which gold coins are reckoned as equal to 15½ times their weight of silver, a disturbance occurs in the market ratio of the metals, such as it is alleged must occur with variations in supply or demand. Let it be assumed that silver becomes cheaper, so that the silver in twenty standard shillings is no longer worth one sovereign in gold, but only three-quarters. That means practically that any person can for three-quarters of a sovereign buy enough silver bullion to make into twenty standard shillings. Clearly under these circumstances no one would pay his debts in gold when by first exchanging it for silver, he would gain five shillings in the pound. On the other hand there would be a rush to melt down gold in order to get the cheap silver, and the gold would, if silver remained below the old legal ratio, be driven from circulation. Under the opposite conditions of silver becoming relatively dearer, it would be replaced by gold, and thus the conclusion is reached that the joint standard would be an alternating standard with the cheaper metal as the real standard at any time. This law, according to which the cheaper metal displaces the dearer, is known as Gresham's Law; and it is found, historically, that a very small difference between the market and the legal ratio will suffice in any particular country to drive the dearer metal from circulation. This theory has been repeatedly illustrated in the history of particular countries. Thus, in England in 1717, according to the ratio adopted by the advice of Sir Isaac Newton, gold was, compared with silver, overvalued about 1½ per cent., that is to say, it was so much more valuable as currency than as metal. Consequently the full-weight silver coins were withdrawn, and gold became the principal currency. In France, on the other hand, at the time of the great Revolution, silver was slightly overvalued, and thus became the principal currency, the gold being to a large extent driven from circulation.

The question then arises: What becomes of this dearer metal, and whence is the cheaper metal derived which must be coined to take its place? It is obvious that in any modern society, the gold or silver displaced will not be hoarded, nor is there any reason why the mere change in relative value should lead to a greater use of plate made of the dearer metal. Accordingly it seems inevitable that this dearer metal should be exported, in order to get the cheaper metal for coinage, for by parity of reasoning it cannot be drawn from hoards or plate

within the country. It is this consideration which is the foundation of the argument, that although one country alone might be unable to maintain both metals as legal tender at a fixed ratio, under a union of the principal commercial countries the system would be quite possible and perfectly stable. For, *ex hypothesi*, there would in this case be no place to which the gold, supposing it became dearer, could be exported, or from which silver to take its place could be obtained. Again, if under these conditions any disturbance in the ratio occurred, (supposing it possible) to the advantage, for example, of gold, the gold would be driven from circulation and converted into bullion. Thus there would be a great increase in the supply of gold, and a corresponding increase in the demand for silver, and it is maintained that the old ratio would at once be restored. This process of reversion to stability is known as the *compensatory action of the double standard*, and was the counterpart of Gresham's Law in the great controversy of the 'eighties.

If, then, the possibility of international bimetalism on a conventional basis is granted, it is requisite next to inquire into the advantages of the system, for in currency above everything the maxim *quieta non movere*, to let things alone, is held to be sound. The advantages claimed in the above controversy were twofold. *Firstly*, it was argued that if the main work of standard money was in the future thrown upon gold, there must be a great fall in prices from the level to which the world had been accustomed with both metals as standard money. It was alleged that the fall in prices that took place after 1874 was mainly due to the substitution of gold for silver as the standard by Germany and other countries, because, taking the world as a whole, the amount of gold had not sufficed to keep up the level of prices. It was further argued that, having regard to the increased use of gold for the arts and the diminished supply from the mines, this fall in prices would continue, or that there would be a continuous appreciation of gold, with a constant increase in the real burden of debts, and a disturbance of the real meaning of contracts and great friction in the adjustment of customary retail prices.

The term *appreciation*, as applied to gold, requires some explanation. If gold is the standard of value, it may be thought that its own value cannot change, just as a foot measure always remains of the same length—that a sovereign of full weight must always remain of the same value. But it is one thing to appoint by law that a certain amount of gold shall be coined into a certain number of sovereigns, and quite another to suppose that these sovereigns shall always exchange for the same amount of wealth. If, on the whole, a sovereign purchases more than it did, from whatever cause, that constitutes an appreciation of gold. An appreciation of gold is thus the same thing as a general fall in prices.

Seeing that the number of purchasable commodities is practically infinite, it is of course not easy to say even that a general fall is taking place, and it is still less easy to measure exactly the extent of the fall. For some commodities may be rising whilst others are falling. The general method adopted is to take certain important commodities as fairly representative. Thus the *Economist*, in its annual review, takes twenty-two commodities and compares their price with the price which was the average between 1845-50. Taking each of the average prices for that period as 100, the total would be 2200. In any subsequent year the actual change in price is worked out in these 'index numbers,' as they are called. Thus suppose during the given period the average price of wheat had been 60s. a quarter, and in some other year it

became 30s., we should have to change the index number from 100 to 50, that is, under it or half. If in adding up the total of the index numbers in any year we find a rise has taken place, then it is assumed this fairly measures the general rise in prices. It may be interesting to quote some of the principal changes in the 'index numbers.' A fluctuating rise took place from 1850 up to 1864 when the index numbers became 3787. This is equivalent to saying that on the articles taken there was an average rise of about 72 per cent. It would, however, obviously be a mistake to argue that all prices must have risen to that extent, especially when we consider that owing to the American civil war the price of cotton was abnormally raised. From 1864 to 1871 there was a fluctuating fall in prices, the index numbers in the latter year being 2590. Then a rise took place, the numbers in 1872, 1873, 1874, being respectively 2835, 2947, 2891. Thus in these years of inflation, as they are often termed, though there was a rise of about 31 per cent. on the original 'index numbers,' there was a still greater fall from the numbers of 1864. From 1874 there was a steady and rapid decline, until on 1st January 1886 the aggregate 'index number' was only 2023, which was lower than the original number, and lower than that of any year subsequent to 1850. It was this very remarkable fall in prices that constituted the appreciation of gold, and it was maintained by bimetalists that if silver were used to supplement gold as standard money the fall in prices would be checked, and that for the future the general level would remain more steady.

Secondly, the adoption of conventional international bimetalism (for that is the only system practically proposed) was advocated not only as a partial remedy for the appreciation of gold, but also as a preventive of fluctuations in the relative values of gold and silver. It was said that the depreciation of silver, caused by the monetary disturbance, injuriously affected our trade with silver-using countries, and that in effect this depreciation acted like a protective duty on imports into such countries, and a bounty on their exports. To these statements of alleged facts it was replied generally that our exports to the East, or silver countries, had largely increased, and that the exports from the silver countries, such as Indian wheat, were really stimulated by other causes—e.g. railways and reduced freights by sea. It is, however, undeniable that if gold prices on this side had remained at their old level, whilst at the same time silver had depreciated, the effects on our eastern trade would have been accurately described by the analogies of a protection duty in the one case and a bounty in the other. So far, however, as the gold prices of commodities fell in the same degree as silver, no such stimulus or restraint appeared to take place. A Manchester merchant might just as well sell to India for the same silver as before, even although it produced only 30 per cent. less gold, as sell to gold-using countries for 30 per cent. less gold, directly without the intervention of silver. Similarly, an Indian exporter had no advantage from cheap silver if he obtained for his exports 30 per cent. less gold wherewith to purchase silver.

Here, however, the question arose whether the depreciation of silver had not directly, to a large extent, caused the fall in gold prices. It is generally admitted that the effect of a bounty is to lower prices in the foreign country, and protective duties operate indirectly in the same way; and, similarly, it was maintained (especially by M. Cernuschi) that the depreciation of silver had lowered all prices measured in gold.

It will be observed that both of these advantages claimed for bimetalism depended upon questions

of fact; and the difficulty in obtaining information was the chief reason for the appointment of the Royal Commission in 1886. No one, however, denied that if by any means the relative values of gold and silver could be fixed, it would be beneficial to the world at large. Mere fluctuations are certainly an evil. The possibility of thus fixing and maintaining a ratio received strong practical support from the fact that for seventy years, in spite of great variations in the relative amounts of gold and silver produced, the existence of bimetallicism in France, and the large use by other nations of silver as standard money, kept the ratio, apart from small variations due to exchange operations, at nearly $15\frac{1}{2}:1$. It may also be said that an international convention, once established, would not be broken in the same capricious manner as a purely political treaty; for it may easily be shown that every nation makes the agreement in the first place with its own subjects, and that by breaking the agreement it would injure them more than any one else. There was really not much more apparent reason why, once established, the system should have broken down, than if all the nations had adopted the same system of weights and measures. In practice, however, the initial difficulties might be insuperable in spite of extremely unsatisfactory conditions in the relations of gold and silver from the monetary point of view.

The United States were compelled by the Bland Act to coin large quantities of silver every year; the Sherman Act (1890; repealed 1893) empowered the Treasury to increase its purchases of silver, but failed to maintain the ratio (see SILVER). The government of India also failed to maintain the ratio by stopping (1893) the free coinage of silver.

But any attempt to adopt gold as the sole principal standard throughout the world would, in Goschen's often-quoted opinion, produce a most disastrous monetary crisis, and thus the choice seemed to lie between an international agreement on a reasonable basis, and the reliance on the self-interest of each particular nation to make no further change through dread of further evil.

It is impossible even to mention in a brief article all the points of controversy on the question of bimetallicism. Until the great and rapid fall in the value of silver compared with gold, it was apparently believed that from some curious but beneficial natural cause the ratio would remain fairly steady, and for about seventy years the variations were very small. Accordingly very little attention was paid to the question by economists, who for the most part were content with saying that it would be difficult for one country to maintain effectively a double standard. Again, when the depreciation set in, it was believed that it would be only temporary, but this belief has proved to be unsound.

The partial failure of the Latin Monetary Union to preserve an international *coinage* need not prejudice the case of a bimetallic union like that proposed by the United States. The Latin Union, proposed in 1865 and accomplished in 1868, was essentially a treaty between certain countries (France, Belgium, Italy, Switzerland) for an identical coinage (apart from the mere stamp) to be received as legal tender in each country. It was only accidentally bimetallic, and no special provision was made for the unlimited coinage of either gold or silver.

The greatly increased annual production of gold, owing to the African and other discoveries, since 1896, and the consequent steady rise in gold prices, has, however, greatly lessened the practical importance of the bimetallic question. A method of economising gold has also been sought by de-

pendent and other countries in what is known as the gold exchange standard. Under this system gold is reserved mainly for international payments, the internal currency being composed of token coins or notes.

To understand the subject in its historical bearings, the reader should consult the Reports of the Royal Commission (1886), of the Indian Currency Commission (1893), and of the Berlin Silver Commission (1894). On the monometallic side may be mentioned Fowler's *Appreciation of Gold*, Sir Robert Giffen's *Essays in Finance*, papers by Wells, and Laughlin's *Bimetallicism in the United States* (1897). On the bimetallic side we may mention various essays by H. Cernuschi, H. H. Gibbs, Grenfell, E. Barclay, S. Smith, &c.; there is, besides, a valuable historical work by the Hon. Dana Horton called the *Silver Pound*; a *Treatise on Money, with Essays on Monetary Problems* (1897), by the present writer, and the *Standard of Value* (1912), by Sir David Barbour, may also be mentioned. The best book for the statistics of the question is Soetbeer's *Materialien*, translated from the German for the use of the Royal Commission, and published in America by Atkinson.

Binary Stars. See STARS.

Binary Theory. In Chemistry, takes cognisance of the mode of construction of salts. It assumes that all salts contain merely two substances, of which either both are simple, or one is simple and the other a compound playing the part of a simple body. The best and most familiar illustration of the binary theory is common salt or chloride of sodium, NaCl, which is constructed of the metal sodium, Na, and the non-metal chlorine, Cl, and is at a glance seen to be a *binary compound* (a compound of two). Although this theory attracted much attention from 1837 to 1855, and was adopted by Liebig and other chemists, it never met with general acceptance, and has now been quite superseded. See ACIDS and SALTS.

Binche, a town of Belgium, in the province of Hainault, 10 miles E. of Mons, manufacturing delfware and lace; pop. 11,000.

Bindraban. See BRINDABAN.

Bindweed. See CONVULVULUS.—The Black Bindweed or Climbing Buckwheat (*Polygonum Convolvulus*) is a twining weed of the Polygonaceæ (q.v.), with convolvulus-like leaves. The seeds, but for their small size, might be used like Buckwheat (q.v.).

Bingen, an ancient town of Hesse-Darmstadt, Germany, is charmingly situated on the left bank of the Rhine, 39 miles SE. of Coblenz. Below the town is the celebrated *Bingerloch*, formerly a very dangerous point in the navigation of the Rhine, but in the year 1834 the sunken rocks were blown up. In the middle of the river stands the *Mäuseturm*, the tower of Bishop Hatto (q.v.). Nearly opposite Bingen, in the Niederwald, is the colossal statue *Germania*, erected 1877-83 to commemorate the war of 1870-71. Pop. 10,000.

Bingham, JOSEPH, a learned English scholar and divine, was born at Wakefield in Yorkshire, September 1668. Educated at University College, Oxford, he was elected fellow in 1689 and college tutor two years later, but was obliged to resign his fellowship owing to an unfounded accusation of heresy in a sermon which he had preached in St Mary's on the meaning of the word 'Person' in the Fathers. He was at once, however, presented to the rectory of Headbournworthy in Hampshire, and here he commenced his laborious and learned *Origines Ecclesiasticæ, or Antiquities of the Christian Church* (10 vols. 1708-22). In 1712 he was preferred to the rectory at Havant near Portsmouth, and in 1720 he lost all his property in the great South Sea bubble. He died August 17, 1723.

Binghamton, a flourishing city of New York, at the junction of the Chenango and Susquehanna

ivers, 215 miles NW. of New York city. It is an important railway centre, and manufactures flour, engines, carriages, leather, and cigars. Pop. (1870) 12,692; (1890) 35,005; (1900) 39,647; (1920) 66,800.

Bingley, a town in the West Riding of Yorkshire, $\frac{5}{8}$ miles NW. of Bradford. It has a training college, and worsted, woollen, cotton, and paper manufactures. Pop. 19,000.

Binney, THOMAS, D.D., LL.D., a Congregational preacher, born at Newcastle in 1798, in 1829 settled in London. He laboured with great success (1833-69) in the new Weigh-house Chapel, near London Bridge, erected for him by his hearers. He died 24th February 1874. His most popular work was *Is it Possible to Make the Best of Both Worlds?* (1853). See *Lives* by Stoughton (1874) and Paxton Hood (1874).

Binocular. See OPERA-GLASS, MICROSCOPE.

Binomial, in Algebra, is an expression which consists of two terms, separated by + or -, such as $x+y$, $ab-cd$. Monomial, trinomial, polynomial are the names given to expressions consisting of one, three, more than three terms. The Binomial Theorem gives an expansion of $(x+y)^n$ into a finite or an infinite series of powers of x and y , when n is a number either integral or fractional, positive or negative, rational or irrational; thus $(x+y)^n =$

$$x^n + nx^{n-1}y + \frac{n(n-1)}{1.2}x^{n-2}y^2 + \frac{n(n-1)(n-2)}{1.2.3}x^{n-3}y^3 + \dots$$

The series is finite when n is a positive integer. It was discovered by Newton about 1666, and was first published in 1704 in the second appendix to Newton's *Optics*. That particular case of the theorem when n is a positive integer was known to mathematicians prior to Newton (e.g. Briggs and Pascal), and Newton himself gave no demonstration of the truth of his theorem. Many demonstrations have been given by subsequent mathematicians, but the validity of most of them has been called in question. See Chrystal's *Text-book of Algebra*.

Bintang, an island of the Dutch East Indies, 40 miles SE. of Singapore; area, 454 sq. m. Gambir, rice, and pepper are exported.

Bin'turong (*Arctictis* = bear-marten), a genus of carnivores in the civet section. Its resemblance to raccoons, beside which it used to be placed, is entirely superficial. It is a slow arboreal and nocturnal animal, partly vegetarian, indeed omnivorous, in its diet, with lank body, coarse dark hair, long tufted ears, and prehensile tail. There is but one species (*A. binturong*), found in India, Malacca, Sumatra, and Java. It is easily tamed.

Binue. See BENUE.

Binyon, LAURENCE, born at Lancaster, August 10, 1869, entered (1893) the British Museum, where he became assistant-keeper. His culture and scholarship are revealed in his poems (*London Visions*, *Auguries*, &c.), plays (*Paris and Aenone*, *Attila*), and art criticism.

Biobío, the largest river of Chile, has a west-north-westerly course of about 220 miles, from near the volcano of Antuco in the Andes to Concepción (where it is bridged) on the Pacific Ocean. It is 2 miles wide at its mouth, and navigable for 100 miles.—Biobío province (area, 5300 sq. m.; pop. 100,000) lies inland. The capital is Los Angeles (pop. 8000).

Biochemistry. See ANIMAL CHEMISTRY.

Biogen'esis, as opposed to Abiogenesis (q.v.), is the name used by Huxley for the theory that living matter always arises by the agency of pre-existing living matter. See also LIFE, SPONTANEOUS GENERATION.

Biography is the artistic representation in continuous narrative of the life and character of a particular individual. It may be either a mere *curriculum vitae*, detailing only the historical sequence of the incidents of a man's life, or it may be an attempt at an analysis of his character, opinions, works, and at a complete reconstruction of the motives of his actions. To the former class the ancient examples of biography, as the *Lives* of Cornelius Nepos, mainly belong, while modern biographers have mostly aimed at the latter method. But of course the inward life is revealed in the outward, and even such a biography as the *Agricola* of Tacitus, with all its stately dignity and reticence, does give the reader some real insight into the character of the man. The main object of biography as now written is portraiture, and its success or failure mainly depends on the degree of truth and completeness with which the image is represented. The facts of a life may be fully and truthfully told without any adequate idea being given of the personality of the central figure, which is often revealed in small details that might well escape the notice of a biographer who lacked the eye to see them and their significance. Thus, as Dr Johnson points out, Sallust has not forgotten in his account of Catiline to remark that his walk was now quick and again slow, as an indication of a mind revolving with violent commotion. But indeed it could not be better put than it is by Plutarch, the prince of ancient biographers, in his 'Alexander,' in a passage aptly quoted by Boswell: 'Nor is it always in the most distinguished achievement that men's virtues or vices may be best discerned; but very often an action of small note, a short saying, or a jest, shall distinguish a person's real character more than the greatest sieges or the most important battles.'

It is hardly necessary to add that there is no more interesting department of literature than biography, that the most fascinating study of mankind has ever been and will ever be man himself, and this hardly less in the lyric or the occasional essay than in the formal biography or autobiography. 'I never look,' says Montaigne, 'upon an author, be they such as write of virtue and of actions, but I curiously endeavour to find out what he was himself.' The genuine lyric is a spontaneous and impassioned expression of an emotion of the writer, and its poetical value depends ultimately on the poverty or richness of his personality; while the essay, as understood by Montaigne, its inventor, and such masters in this form as Addison and Charles Lamb, owes no small part of its charm to the pleasing egotism by which hints as to the feelings and foibles of the writer are conveyed by the way to the sympathetic reader. Biography is commonly used as an introduction and key to the works of poets, prose-writers, composers, and other creative artists, the life being illustrated by the works, and the works interpreted in the light of the life.

Many lives (e.g. Lady Burton's biography of Sir Richard Burton) are written in such eulogistic terms that they fail by default to give a truthful picture of their subject, while others, in their fear of being unlike life, deepen the shadows until the picture becomes equally untrue through its over-truthfulness. When rhetoric and adulation obscure or violate the truth, as in so many funeral orations and pious tributes to lives still in progress or newly terminated, biography becomes idle panegyric. *Hagiography*, the branch of biography concerned with the lives of saints, is naturally prone to this tendency, which marks most of the earliest British biographies, such as Adamnan's *Life of St Columba*. On the other hand, many critics accused Froude of having given such undue prominence to the dis-

agreements between Carlyle and his wife as to distort completely the picture of the ordinary life of the pair; while Froude's defenders urged that he had but painted Carlyle as Carlyle would have painted himself, every wrinkle on the face truthfully represented on the canvas, and that his business was to describe the man as he lived, not as he should have lived. Again, a biographer may not understand the relative significance of things, and thus unconsciously give an untrue picture of his subject. Especially is this danger close to him when he has to deal with a time or a society in which he himself has not lived. It is difficult for him to breathe freely in another atmosphere than his own, and avoid anachronisms in feeling if not in fact. Hence the peculiar value of biographical studies by recognised authorities on the period involved, as, for instance, Austin Dobson's 18th century monographs. 'Tell me the company you keep,' says a French proverb, 'and I will tell you who you are.' On this principle some biographers devote special attention to the associates of the person whose life they record, and surround the portrait of their subject with a frame of friendships; in *Charlotte Brontë and her Circle* (1896) Clement Shorter claims to have set a fashion of this kind.

A biographer must have an adequate knowledge of his subject and his surroundings. He must follow him in his controversies and his speculations, and must be able to weigh in the balance his abilities as well as his private virtues. Thus the best biography should be that written by one almost as great as his hero, skilled in the same things, with full sympathy and perfect knowledge, as the life of Dr Arnold by Dean Stanley, and Boccaccio's life of Dante—'a great man,' says Emerson, 'to describe a greater;' while the worst should be the production of the professional biographer, who is ready at a moment's notice to write to order lives of poet, philanthropist, or scientist alike. Boswell, however, was not nearly so great as his hero, though he had insight enough to write the best biography in the English language; while, from a merely literary point of view, some of the most effective biographies we possess were written by men of letters, lacking the special technical knowledge that might have been deemed necessary. Southey's life of Nelson is admittedly one of the most perfect biographies in existence, yet the author tells us that he had to move among the naval terms like a cat among crockery. Indeed adequate insight and sympathy, with a fine sense for literary form, may make up a complete equipment for a biographer, for Walton's lives are absolutely perfect examples of biography, though the garrulous old angler could scarcely have understood the full significance of the great work of Hooker. There are few books in English of such abiding interest and excellence as Johnson's *Lives of the Poets*—a singularly happy combination of sympathy and intelligence, although at the same time a collection of lives of very unequal values. No less admirable are Macaulay's short lives of Johnson, Goldsmith, Atterbury, and Bunyan, written for the *Encyclopædia Britannica*; and Scott's shrewdly sensible lives of Swift, Dryden, Richardson, Fielding, Smollett, Goldsmith, Johnson, and others. Lockhart's *Scott* is generally, and with good cause, ranked next to Boswell's *Johnson* among English biographies.

Most modern biographies are too large—they err by not selecting merely the significant. Perhaps it is true that near things look too large, and that the right perspective is only possible to the observer at some distance. The lives of the greatest men must teem with details that are quite ordinary and unimportant, and we gain absolutely nothing by

having these set down. The biographer must be more than the mere realist who can photograph facts—he must be something of the idealist as well, for he has to create as well as reproduce; and we value a biography exactly in proportion as its author has succeeded in creating for us the character of a new man or woman to be added to our personal acquaintance. If, as has been said, every man's life is worth telling for something that there was in it of unique interest, it may be equally true that all the life save this particular part was not worth telling at all, and had better been left untold. Although undoctored human nature with its swarm of struggling and contending motives is always an interesting study—in its morbid no less than its normal phases—yet the elaborate dissection of mere human frailty must ever be a wearisome and unprofitable pursuit. Man's spiritual aspirations cannot be fed upon mere clever character-analysis, and lives that had in them nothing high for humanity had better be soon forgotten. Some lives are so long, so eventful, so documented, as to defy satisfactory concise treatment, with the result that students now tend to elaborate this, that, or the other chapter of such a crowded career (cf. Lord Rosebery's *Napoleon: The Last Phase*) rather than attempt to deal with it as a whole. In like manner modern literary biographers often confine themselves to the formative period of a great writer's life. Émile Legouis's *The Early Life of Wordsworth* (1897) is one of numerous studies of genius in its youth. Other biographers, again, finding their subject's actual lifetime insufficient for their purpose, dwell at length on prenatal influences and events—taking as long to get their hero born as Sterne takes to bring Tristram Shandy into the world—or expatiate on his legacy to mankind and his posthumous reputation. In the first volume of his life of Francis Galton, Karl Pearson with unprecedented and appropriate scientific thoroughness examines the ancestry of the author of *Hereditary Genius*.

The lives of the great men who have helped to mould their times throw much light on contemporary history. The biographies of Cromwell, Frederick the Great, and Napoleon, broadly speaking, sum up great part of the public history of their times, but do no more for us than merely throw a side-light on its social history, which must be reconstructed by a wide and patient study of the conditions of life of the common people. Masson's life of Milton, despite its ponderous learning and great accuracy, cannot be regarded as a model biography, overweighted as it is with an enormous mass of detail about contemporaries unjustified by anything but a roundabout and indirect connection with Milton himself, who, spite of his poetical and even political importance, was not by any means the centre of the destinies of England. Carlyle's life of John Sterling, again, is an example of an almost perfect biography, and yet it is that of a man whose life was in some respects hardly worth writing at all. He was indeed a man of high aspirations and clear intellect, but beyond this there was scarcely anything very memorable in him, and the abiding charm of the book is due to nothing but the consummate art of the writer and his revelation of himself in sympathy with his subject. Cross's life of George Eliot errs in the opposite direction. Here the biographer adopted the method of making the subject speak entirely by extracts from letters, with the very briefest possible connection of narrative. But by keeping himself so much out of sight, the writer only avoided Scylla to fall into Charybdis, and succeeded in making a book dull and lifeless that should have been unusually full of interest.

So popular a form of literature has biography

become that in the early years of the 20th century from 400 to 500 new Lives were published annually in the United Kingdom alone, including two or three dozen translations from foreign languages. Many biographies, by having a subject of too narrow interest, or by treating a subject in too narrow and special a sense, do not reach the level of a permanent place in literature, though they may have been treated with full knowledge, fine literary sense working within the conditions laid down, and even proper sense of relative proportion. Every year produces examples of biography which are doomed, spite of more or less creditable literary workmanship, to be soon forgotten, from the ephemeral importance to the world of their subjects, and the controversies in which they were involved. Each one, for example, of our hundred religious denominations has its heroes—all important to its own sectaries, but not necessarily of the slightest value to the infinitely wider world. The lives of these men are full of interest within the small circle of their personal influence, but they do not in the least touch the sympathies of readers outside it, unless they chance at once to be written with more than ordinary literary skill, and to be revelations of figures with dimensions much beyond those of the usual church leader or pulpit orator. But unfortunately the hero of our religious biographies is not always a Wesley, a Chalmers, an Edward Irving, a Whitefield, or a Pusey, any more than the biographer is always a Southey, a Hanna, a Mrs Oliphant, or a Liddon. Similarly, there is hardly an eminent man of science, actor, musician, writer, statesman, millionaire, or soldier whose life is not written (often in his own lifetime) at more or less extravagant length, and with a more or less absurd overestimate of his relative importance.

We have many lives, moreover, of very great inherent importance indeed, which appeal to comparatively small circles of readers from the large demand they make upon the possession of special culture or knowledge. Such are many of our larger lives of philosophers, artists, and musicians. Crowe and Cavalcaselle's lives of *Raphael* and *Titian*, Spitta's *Bach*, Jahn's *Mozart*, Karasowski's *Chopin*, and Woltmann's *Hans Holbein* are excellent examples of solid, conscientious, and exhaustive biography, but of too large proportions for the mere literary student.

All history is full of the materials of biography, though it is only in the narrowest sense true that history is nothing but an aggregation of the biographies of individuals. Not a little of the interest in ancient and modern histories alike depends on the pictures of men and women with which their pages are lighted up, and this we find in annalists like Livy and Tacitus, no less than in professed biographers like Plutarch and Suetonius. Perhaps no more living portraits were ever painted than those sketched in a few touches in the lurid colours of Tacitus. In the hastiest sketch of the master we see far more than in the most finished painting by the dauber. Such books as Holinshed's *Chronicle*, Clarendon's *History of the Rebellion*, Burnet's *History of his Own Time*, and Shakespeare's historical plays, from the portraits of individuals they contain, have an additional interest that is only second to their historical importance. Indeed it is far more than a paradox to say that such works of creative fiction as the last are truer than the records of history themselves, for they are informed with a deeper inwardness than these, and do far more to create for us the actual living objective figures of history. Shakespeare's Richard III. is not only a magnificent creation as the dramatic revelation of a matchless usurper, but it is so true a realisation of this working on a sound basis of consistent tradition that it satisfies,

as Mr Gairdner tells us, the requirements of historical truth almost as much as any formal history. Shakespeare's historical figures are not puppets dressed in old clothes, but living and breathing men and women, and the bare historical details of their characters and lives have become fused in his glowing imagination and harmonised into consistent wholes stamped with the warm and actual impress of very truth. This is hardly less true of Macaulay's *History*, and still more of Carlyle's *French Revolution*, with its vivid portraits of even the minor figures flashed like instantaneous photographs upon the reader's brain. Again, books like Spence's *Anecdotes*, Disraeli's *Calamities of Authors* and *Quarrels of Authors*, are full of rich material for the biographer, as are also such critical essays as those of Macaulay and Carlyle, hardly less than professedly biographic studies like Hayward's *Sketches of Eminent Statesmen and Writers*, and Bagehot's *Biographical Studies*.

One word must be said on the question of the biographer's reticence. Voltaire said, 'We owe consideration to the living; to the dead we owe only truth.' Doubtless this is true if the dead have slumbered long enough to be regarded somewhat impersonally even by their own descendants, but no language is too strong to reprobate the conduct of those writers of biography or autobiography who ruthlessly tear open unhealed wounds and bridge their malice across the separating grave. The concluding and posthumous volume of Campbell's *Lives of the Chancellors*, containing the lives of Brougham and Lyndhurst, is an example of biography, whether due to deliberate malice or no, full of misrepresentation and inaccuracy, to say nothing of lack of generosity and good taste in treating the life of great living contemporaries. Political or religious bias often affects the biographers of great statesmen and churchmen; and the life of a Napoleon, a Mary Stuart, a Cromwell, or a Claverhouse may be strangely distorted by devotees and iconoclasts.

Standard and other biographies of the more important persons dealt with in this Encyclopædia are mentioned at the end of the articles in question, as also in the concise *Chambers's Biographical Dictionary*. 'Authorised' lives of the great are now commonly issued, the biographer being chosen and aided by the subject of the biography, his trustees or family. Thackeray, among others, refused to sanction an authorised life. Some of the best English biographies have been already named; others are Moore's *Byron*; Morley's *Diderot* and *Rousseau* and *Gladstone*; Trevelyan's *Macaulay* and *Fox*; Sir Theodore Martin's *The Prince Consort*; Carlyle's *Frederick the Great*, his *Schiller*, and his *Letters and Speeches of Oliver Cromwell*; Stopford Brooke's *Robertson of Brighton*; Cox's *Marlborough*; Lewes's *Goethe*; Talfourd's *Lamb*; Mrs Gilchrist's *Blake*; Mrs Gaskell's *Charlotte Brontë*; Washington Irving's *Columbus*; Sparks's *Washington*; Hayley's *Cowper*; M'Crie's *Knox* and *Andrew Melville*; Lytton's life by his son and grandson; Spedding's *Bacon*; Hamerton's *Turner*; Mark Pattison's *Casaubon*; Helps's *Cortes*, and his *Pizarro*; Froude's *Erasmus*; Forster's *Goldsmith*, *Landor*, and *Dickens*; Maurice, by his son; *Longfellow*, by his brother; Seeley's *Stein*; Dowden's *Shelley*; Cabot's *Emerson*; J. Dykes Campbell's *Coleridge*; Lord Wolseley's *Marlborough*; Henry James's *W. W. Story*; Holland Rose's *Pitt*; Sir Sidney Lee's *Shakespeare*; Monypenny and Buckle's *Beaconsfield*; Lord Randolph Churchill's life by his son Winston; Wilfrid Ward's *Newman*. Remarkable short biographies are More's *Henry VII.*, Cavendish's *Life of Wolsey*, Mrs Hutchinson's *Memoirs* of her husband, and *Crabbe's Life*, by his son.

In the French and German languages there are many excellent examples of biography. Here it may be enough to mention the names of some authors whose biographical works are among the most valuable: In France, Fléchier, Fontenelle, Voltaire, Boissy d'Anglas, Villemain, Cousin; and in Germany, Schröckh, Herder, Klein, Meissner, Heeren, Luden, Varnhagen von Ense, Barthold, Döring, Pertz, Haym, Arneth, Otto Jahn, Chrysander, Kapp, and Droysen. Dilthey's *Schleiermacher*, Haym's *Hegel*, and Nippold's *Rothe* may also be named. Some excellent biographies that have been translated into English are Köstlin's *Luther*, Zeller's *Strauss*, Loménie's *Beaumarchais*, Düntzer's *Goethe*, *Schiller*, and *Lessing*.

Autobiography.—No form of composition is of more abiding interest than that in which a man narrates his own history, unlocks his heart, and takes the public into confidence by laying bare the motives of his life. To know one's self was the first and last step to wisdom, according to the Greek sage. Dr Johnson thought every man's life could be best written by himself, and doubtless so it could if every man were a Dr Johnson. It is needless to say that nothing can be more difficult than to preserve the just balance between due modesty and overweening self-consciousness and self-esteem. In this form there are no better examples in the English tongue than those of Gibbon and Hume, and the opening sentence of the latter is memorable as a canon of art: 'It is difficult for a man to speak long of himself without vanity, therefore I shall be short.' It would be invidious to name autobiographies which reveal a complete overestimate of the writer's own abilities or importance, though our contemporary literature is by no means barren of such books, often naïve and unconscious to a degree.

Baber, the Great Mogul, who died in 1530, has been called the Prince of Autobiographers. Autobiographies of more than ordinary value are those of Lord Herbert of Cherbury, Sir Kenelm Digby, Jerome Cardan, Ellwood, Clarendon, 'Jupiter' Carlyle, Thomas Boston, Franklin, Haydon, Talleyrand, O. W. Holmes, Harriet Martineau, Béranger, Miss Mitford, Mary Somerville, Hugh Miller ('*My Schools and Schoolmasters*'), Meadows Taylor, Hans Christian Andersen, Leigh Hunt, Berlioz, Macready, John Stuart Mill, George Sand, Mark Pattison, Anthony Trollope, Alphonse Daudet in *Trente Ans de Paris*, Sir Henry Taylor, John Ruskin in *Præterita*, and the fragment in Carlyle's *Reminiscences*, with its strange sad story of self-reproach lightened up with rare literary charm and gleams of tenderness that make it unique in English literature; Vambéry, Bismarck, Wagner, Kropotkin, Rochefort, Bebel, Roosevelt, Haeckel, Russel Wallace. Among those who, like Renan, have recalled the fascinating story of their childhood and youth are Gorki, Brandes, Edmund Gosse (in *Father and Son*), Helen Keller, and Henry James (in *A Small Boy and Others*).

St Augustine's *Confessions* stands by itself as a revelation of the spiritual history of perhaps the greatest intellect that has ever been entirely mastered and moulded by religion. Completely different in most respects, but hardly less valuable as a confession of the strange spiritual history of a mighty intellect and a great heart, is the *Apologia* of Cardinal Newman. Sir Thomas Browne's *Religio Medici* has high value as a confession of faith, but not a little of its exceptional literary charm depends upon the pleasing egotism with which its author reveals his foibles to the reader. The *Grace Abounding* of Bunyan is a spiritual autobiography of singular intensity, in spite of itself of high value as literature. Rousseau's *Confessions* is a book of rare interest, but hardly of such precious value as

its author imagined, for the ear of the modern reader never fails to detect the ring of the counterfeit that deprives it of half its charm by robbing it of reality. Goethe's *Dichtung und Wahrheit* stands quite alone as the self-told history of the artistic growth of perhaps the best-cultured intellect that the world has ever seen; but its value would be greater if, to use the author's own antithesis, we knew quite how much is truth and how much is poetry. Borrow's *Lavengro* is a book difficult to class, but is substantially an autobiography at least; and the same is equally true of De Quincey's *Confessions of an Opium Eater*, one of the strangest books in our language. Some of our greatest novels contain autobiography wrapped up more or less obscurely in them, and to the consequent reality may owe no little of their power. We know that the story of *David Copperfield* closely follows the early life of Dickens, and that George Eliot herself was just such a girl as Maggie Tulliver in *The Mill on the Floss*. Sterne frequently blends autobiography with fiction; so, too, does Anatole France. There are other books about which it is doubtful how far they are fact and how far fiction, as the *Memoirs of Captain Carleton*. Defoe's *Memoirs of a Cavalier* might well have been true, and the great Chatham did no wrong to his intelligence in accepting it as actual history. On the other hand, such amazing yet genuine records of scoundrelism frankly owned as Benvenuto Cellini's Autobiography and Casanova's *Memoirs* might excusably be classed with picaresque novels of the type of *Gil Blas* or Thackeray's *Barry Lyndon*. Indeed, as a form of literature, the novel, whether romantic or realistic, is (like the drama and the epic) more or less fictitious biography or—when the story is told in the first person in order to appear more vivid and veracious—autobiography.

The letters of Cicero, Madame de Sévigné, Pope, Gray, Cowper, Lamb, and such masters in this form teem with invaluable autobiographical details; and indeed most modern biographies are largely made up of the letters of the subject, and thus are to a great extent autobiographic in character; while many important biographies, as those of Scott by Lockhart, General Grant by his family, and Charles Darwin by his son, contain an autobiographical portion, and so belong to both divisions at once. Much autobiographical and biographical material is also found in diaries, journals, and memoirs written with or without a view to publication. Through such intimate records Pepys, Evelyn, George Fox, Lady Fanshawe, Swift, Madame D'Arblay, Wesley, Horace Walpole, Sir Walter Scott, Crabb Robinson, Senior, Greville, Queen Victoria—to mention only a few—give us inestimable information regarding themselves and their contemporaries. The works of travellers, administrators, soldiers, and social reformers are, as a rule, stocked with autobiographical matter. French literature is particularly rich in *Mémoires*, those of the Comte de Grammont and of the Duc de Saint-Simon being among the most famous. The *Journal* of Marie Bashkirtseff is a masterpiece of self-revelation.

Among biographical works, some are universal, as Michaud's *Biographie Universelle* (1811-28; new ed. 45 vols. 1842-65); the *English Cyclopædia*, biographical section (1856-57); *Nouvelle Biographie Générale* (46 vols. 1857-66); among older books, Bayle's *Dictionnaire Historique et Critique* (1697); Chalmers's *Biographical Dictionary* (32 vols.; new ed. 1812-17); and for our own contemporaries: Vapereau's *Dictionnaire Universel des Contemporains* (6th ed. 1892); the *Dizionario Biografico* of Gubernatis (1880); *Men of the Time* (15th ed. 1899); and *Celebrities of the Century* (1887). Of certain classes only are Vasari's *Lives of Painters, Sculptors, and Architects*; Mrs Jameson's *Memoirs of Early Italian Painters*; Cunningham's *Lives of the most Eminent British Painters*;

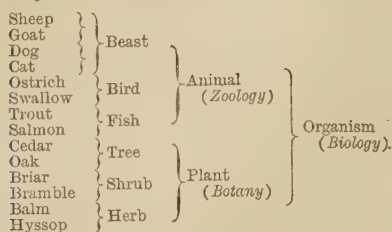
Doran's *Their Majesties' Servants*; Bettany's *Eminent Doctors*; Lord Campbell's *Lives of the Lord Chancellors, and Lives of the Chief Justices*; Dean Hook's *Lives of the Archbishops of Canterbury*; Dr Smith and Dr Wace's *Dictionary of Christian Biography*; Agnes Strickland's *Lives of the Queens of England, of the Tudor Princesses, and of the Last Four Princesses of the House of Stuart*; the *Acta Sanctorum* of the Bollandists; Johnson's *Lives of the Poets* (1781); Smiles's *Lives of the Engineers, and Industrial Biographies*; Grove's *Dictionary of Musicians* (1879-85; new ed. 1904-10); Müller's *Biographisches Künstler-Lexicon der Gegenwart* (1882). Others again are for certain countries only, as Fuller's *Worthies of England* (1662); *Biographia Britannica* (1747; new ed., unfinished by Kippis, q.v., in 1778-93); Chambers's *Dictionary of Eminent Scotsmen* (1835); Sparks's *American Biography* (1834), and Appleton's *Cyclopædia of American Biography*, edited by J. Grant Wilson and John Fiske (6 vols. 1887-88); and our own *Dictionary of National Biography*, which was edited by Sir Leslie Stephen from 1885 to 1891, and completed (63 vols., with 6 vols. of supplement, index, and epitome) in 1912 by Sir Sidney Lee. There are similar works for France, Italy, Germany, Austria, Belgium, Denmark, Sweden, &c.

Special groups of books that are at once biographies and critical studies are the 'English Men of Letters' series, 'Les Grands Écrivains Français,' and 'Écrivains Étrangers.' In the first, Leslie Stephen's *Johnson*, Dean Church's *Spenser*, Mark Pattison's *Milton*, Lord Morley's *Burke*, Canon Ainger's *Lamb*, and Sidney Colvin's *Keats* were permanent gains to English literature; the second series opened well with Jules Simon's *Cousin, Albert Sorel's Montesquieu*, Gaston Boissier's *Madame De Sévigné*, and E. Caro's *George Sand*; the third includes Legouis's *Chaucer*. The 'American Men of Letters' series contains good studies on *Hawthorne* by J. R. Lowell, *Washington Irving* by C. D. Warner, and *Emerson* by O. W. Holmes; the 'American Statesmen,' lives of *Jefferson* by John F. Morse, and *Adams* by James T. Hosmer. A similar series is that of the 'English Worthies,' edited by Andrew Lang, containing books so good as *Darwin* by Grant Allen, *Marlborough* by Saintsbury, *Raleigh* by Gosse, and *Steele* by Austin Dobson. Other series depending largely on the biographical interest are 'The Great Musicians,' among them *Weber* by Sir Julius Benedict, and *Wagner* by Hueffer; the 'Great Artists,' with *Dürer* and *Titian* by Heath, *Hogarth* by Dobson, *Turner* by Monkhouse, and *Velasquez* by Stowe; the 'Eminent Women' series, with *Maria Edgeworth* by Helen Zimmern, *Mary Lamb* by Annie Gilchrist, and the *Countess of Albany* by Vernon Lee; 'English Philosophers,' with *Bacon* by Fowler, and *J. S. Mill* by Helen Taylor; and the 'New Plutarch,' with *Coligny* by Walter Besant, *Franklin* by Beesly, *Victor Emmanuel* by Dicey, *Abraham Lincoln* by Leland, and *Haroun Alraschid* by Palmer. Somewhat similar, and indeed the earliest of such series as these, are 'Ancient Classics for English Readers,' including literary studies with a biographical setting of *Horace*, *Cicero*, *Xenophon*, *Plato*, *Aristotle*, &c.; and 'Foreign Classics for English Readers,' including similar books devoted to *Rabelais*, *Voltaire*, *Goethe*, *Pascal*, *Diderot*, &c. The 'Philosophical Classics' include monographs so masterly as *Hegel* by Edward Caird, *Berkeley* by Campbell Fraser, and *Vico* by Robert Flint. The 'Twelve English Statesmen' included Freeman's *William the Conqueror* and Lord Rosebery's *Pitt*. Other series are 'Leaders of Religion,' 'Rulers of India,' 'Heroes of the Nations,' 'The Queen's Prime Ministers,' and 'Contemporary Writers.' See LETTERS.

Biology (Gr. *bios*, 'life'; *logos*, 'discourse'). This term has been occasionally abused in English popular writing, more especially in the absurd word *electro-biology*, which at one time threatened to take root in popular usage (see ANIMAL MAGNETISM), and has even by some scientific writers been confused with general physiology, or a special province of it. Yet the established and only legitimate meaning of biology is its literal one, that of the science of life—i.e. the science which seeks to classify and generalise the vast and varied multitude of phenomena presented by and peculiar to the living world. In the following outline the science and its general relations may be conveniently discussed under seven heads.

1. *Origin and Rise of Biology.*—Science being simply a systematised development of our common experience, it is with no more than that simplest knowledge of living beings possessed by the savage or the child that the future biologist sets out. These already keenly observe the forms of life around them: the sheep and goat, the dog and cat, the fowl and sparrow, the trout and salmon, are all clearly recognised and named; and similarly with plants. Classification, too, naturally arises; the birds, beasts, and fishes become more and more clearly defined; and even the residual mob of 'creeping things' discloses possibilities of orderly arrangement. Cedar and oak obtain the common name of trees, briar and bramble of bushes, balm and hyssop of herbs; but beyond this level it is not easy to pass. He is therefore 'the best botanist who knows most plants,' the greatest naturalist who can recognise the appearance and recall the names of the greatest number of living things, or at anyrate can remember most about each of them. This fundamental but as yet scarcely scientific knowledge comes to be recorded in a literature of natural history which varies indeed in accuracy and fullness, yet remains unchanged in spirit and purpose whether we open the pages of Pliny, Gesner, or Buffon. White's *Natural History of Selborne* may be taken as the classic English example of this nascent phase of biology; and its wide acceptance is not hard to understand, since at this level of simple but comprehensive interest in living beings, every one is by nature, however unconsciously, something of a biologist. But the habit of observation insensibly develops an increased perception of likenesses and differences; collections too arise; the power and need of classification develop and cultivate each other beyond the popular level, and a community of naturalists is thus insensibly formed. These divide, in the first place, into zoologists and botanists, among whom minor circles of specialists occupied with definite groups appear in turn. While this division of labour is apparent, its result is always giving us more and more definite general ideas of the groups studied, and this process of generalisation is summed up from time to time by a mind which unites the old breadth of interest with the newer depth of knowledge. Classifications are continually approximating towards completeness; our masses of knowledge respecting the plant and the animal world are at last brought together as botany and zoology, and the final advance is made through seeking to unite the generalisations of the two. Just as ostrich and swallow, shark and salmon, become united into the common logical genera of bird or fish, so inevitably do plant and animal become united into the general conception of *organism*. Their details of habit and processes of life come to be viewed in general terms of *environment* and *function*. Unity becomes more and more discerned under the manifold variety of these, and the conception of a united and general biology at last lies clear before us. It is, in fact, with the naturalist as with the chemist or mineralogist: the latter has his interest at first awakened by the variety of glistening stones, but soon finds himself eager to interpret and systematise the actual varieties of crystalline form in terms of a few simple ideal ones, with modifications in relation to particular circumstances; while the former passes from the empirical description of the experimental details of the science to the interpretation of these by reference to the properties of chemical elements and the laws of their molecular interaction and arrangement. Similarly, the naturalist passes from empirically recording his observations of living nature or the treasuring of its defunct spoils, to analyse and unify the general problems of life; and thus becomes a biologist proper. It may be well

clearly to sum this historical advance diagrammatically:



From this diagram the striking contrast, yet continuous gradation, between two such familiar classics as White's *Selborne* and Spencer's *Principles of Biology* may be clearly understood, and by tracing the steps of its correction and development (see BOTANY and ZOOLOGY), the history of scientific advance might be recorded, and even the field of each investigator marked out. Since these details will be outlined under BOTANY and ZOOLOGY, it suffices here to point out that progress has lain in continuously uniting these extremes, so that the crude empiricism which at first absorbed the more concrete students, and the vague and useless metaphysics which were wont to discredit the abstract ones, are being steadily replaced by a compact body of generalisation, along which the specialist at any point may safely ascend to the widest theories of the science, and by which the most abstract thinker may similarly return to lay clear hold of the minutest details of any order of empirical fact. Hence we can clearly understand the way in which the conception of biology was actually first formulated at the beginning of the century, independently and simultaneously by Lamarck and Treviranus (1802); the former rising from his early botanical studies and his *Histoire Naturelle des Animaux sans Vertèbres* to the elevated conceptions of his *Philosophie Zoologique*, which reached general principles as the outcome of detailed studies; while the more abstract mind of the German Treviranus occupied itself with details essentially as interpreted by the help of general principles.

The conception of biology, it will be noted, has thus come to be used with two different contents: in speaking of the principles of biology, we refer to the body of generalisations common to plants and animals; while in speaking of the science of biology, we include the entire body of botany and zoology, with all their concrete sub-sciences. Yet there is here no discord, and we may conveniently accept the definition of Charles Robin: 'Biology is the science which has for its object the study of organic beings, and for its end the knowledge of the laws of their organisation and activity.'

2. *Subordinate Provinces of Biology*.—The results of this natural history study of plants and animals, which seeks above all things to know the actual forms of life, are of course in the first place to be sought in the numerous separate articles devoted to particular animals and plants; next, in the articles devoted to separate families, natural orders, classes, and sub-kingsdoms, and finally under BOTANY and ZOOLOGY; while the facts relating to their distribution upon the earth's surface, in present and in past time, are outlined under GEOGRAPHICAL DISTRIBUTION and PALÆONTOLOGY respectively. Underlying this empirical view of plants and animals, yet essential to the classification which can alone give this any intelligibility or completeness, lies a detailed analysis of each of these multitudinous forms, which we call *anatomy*. This involves comparison, and *comparative anatomy* arises; but as we come to discern the marvellous unity of type which underlies all apparent differences, and as we (e.g.)

decompose all flowers into variously arranged leaf-whorls, or fancy that we can reduce all skulls to vertebræ, or again analyse the organism into organ, tissue, or cell, the conception arises of what was at first called transcendental or philosophical anatomy, but which later became known as *morphology*. This term has also been extended, and on the whole with advantage, to include not only these widest generalisations of unity in organic forms, but all the details as well, in fact all the *static* aspects of organisms as distinguished from their *dynamic* or vital ones, which we similarly group under *physiology*. In the same way the crystallographer is, as it were, the pure morphologist, but with him we can scarcely avoid including the descriptive mineralogist as well.

But while the morphologist deals primarily with the anatomical facts presented by the organism before him at a given moment, he can only fully understand the origin of these and still more their resemblances and differences by reference to its form at earlier and earlier past times; and in the endeavour to reach this fuller conception of form no longer viewed at rest, but as a result and phase of change, we constitute the sub-science of *embryology*. See ANATOMY, MORPHOLOGY, EMBRYOLOGY.

Yet our biological studies are even now not biological in the most literal sense, for the study of mere forms can take no note of the life which possessed or produced them. The morphologist's dealings are with fossil and corpse; his botanic garden is a herbarium, his appliances the scalpel and lens; whereas it is the harder task of his physiological colleague, instead of simply describing the machinery of life, to comprehend it in action. He thus of course requires an acquaintance with the results of the study of forms, but only for the sake of applying, and if possible interpreting these. In a word, his problems are no longer those of statics, but of dynamics. These dynamic or physiological problems in the first place concern the individual organism at a given time both as a whole and analysed; we study its internal and external relations—its respiration and nutrition in all cases, its sensation and movement if such there be. But the conception of phases of function at successive times necessarily also presents itself; and the more complex problems of growth and adaptation, of variation and of disease, thus arise; while when we pass from the study of the organism alone to its relations to the species, the processes of reproduction and the marvels of heredity appear for elucidation (see ENVIRONMENT, HEREDITY, PATHOLOGY, PHYSIOLOGY, REPRODUCTION, VARIATION). And in all these cases, as we shall see below, these problems may be attacked at different levels—i.e. in terms of organ, tissue, cell, or protoplasm.

3. *History of Morphology and Physiology*.—The progress of our concrete knowledge of plants and animals is respectively outlined under BOTANY and ZOOLOGY, and even from these articles it will be sufficiently obvious that these two developments are not mere isolated streams of discovery, but have a deeper than biographical interest. Our historic inquiry must now seek to fuse these two detailed chronicles of botanical and zoological advance into a broad and general sketch. This should show how the whole development of modern biology, despite its multitudes of past and present workers, and its apparently overpowering wealth and variety of detail, lies upon a few essential lines of investigation, which have been opened up by a magistral succession of original thinkers, and simply extended and elaborated by their respective schools. For were this grasp of general principle once obtained, it is evident that we should be in

possession, not merely of an additional fragment of more or less interesting historical information, but of a well-twined and trustworthy clue which should at once guide us through the teeming maze of organic nature, and among the corresponding recesses of the vast and increasing library of biologic science.

(a) *Morphology*.—Starting then from those chaotic accumulations of fact and blunder, myth and fancy, of practical usefulness and traditional quackery, which characterise the medieval encyclopædias of natural history, we find their inevitable criticism and replacement at length fairly undertaken in the latter half of the 17th century by the labours of John Ray and his minor contemporaries. Yet the period of general natural history was not to end for a century, for it is in Buffon's wide and brilliant survey of all that was known of animal life—the famous *Histoire Naturelle Générale*—that the ancient school found at once its highest outcome, its monument and grave. The modern period, then, essentially opens with Linnæus, whose importance depends upon his having brought to bear upon the confused accumulations of the past the critical and analytic skill, the accuracy and descriptive power, and the classificatory resources of existing logic, which had hitherto been dragging on a merely academic or at most controversial existence, but left almost devoid of concrete or constructive applications. The importance of the order introduced by his binomial nomenclature, his establishment of the categories of species and genus, order and class, his precision of descriptive terminology and the like, can hardly be overrated; while his definite concentration for classificatory purposes upon the precise form of the organism as distinguished from its mere general appearance and mode of life, laid the basis of the future science of pure morphology. Despite the opposition of Buffon, whose thoroughly synthetic attitude and ardent enthusiasm of living nature were alike naturally repugnant to the cold analysis of the new Linnæan school, this necessarily triumphed, indeed too completely. The orderly and exhaustive catalogue of natural forms begun by Linnæus was ardently taken up by his pupils, and handed on to his innumerable intellectual heirs; and it is still in progress, as every systematic monograph, such as those of the *Challenger Expedition*, still testifies. Each new species described means in fact a new leaf added to his *Systema Naturæ*, and the original work is thus, as it were, under continual revision and extension by a succession of sectional sub-editors. Yet, although invaluable as an index to the museum of nature, and indispensable as a catalogue for the future library of the science, the preparation of this systematic description of species gradually enslaved its labourers, and blinded them to all the other problems presented by the living beings which came under their notice. But although this disastrous tendency remains even now too common, the required deepening of the science was soon fairly begun by Jussieu, who passed from the description of external forms alone, and the artificial and provisional grouping of species by their superficial characters, to the establishment of large natural alliances upon a basis of comparative anatomy. He thus not only founded the 'natural system' in botany, but suggested to Cuvier that re-examination of the animal world upon similar lines which became his life-work. But this supplementing of superficial description by detailed anatomical and comparative research has not only given us the classic *Règne Animal* of Cuvier, but its continuation by an entire school—the comparative anatomists. Of these Meckel, Müller, and Gegenbaur in Germany, Milne-Edwards and Lacaze-Duthiers in France, Owen and Huxley in

England, will be remembered among the most historic veterans.

The next step, that of penetration below the study of organs, is due to Bichat, who analysed the body into a series of simple tissues—muscular, nervous, glandular, connective, &c., with definite structural characters. Here, then, a new movement—the histological—found its beginning, and thus under Bichat's *Anatomie Générale* we may group not only the labours of his immediate successors, but all those researches on embryonic layers and tissue structure which have of late formed an increasing proportion of recent literature.

Histology had not, however, found in the study of tissues its ultimate basis. The microscopic studies of the botanist Schleiden led him, in 1838, to the conclusion that all plant structures were built up of separate unit-masses or *cells*, a generalisation immediately extended to animal structures by Schwann, who published in the following year his famous *Microscopic Investigations on the Accordance in the Structure and Growth of Plants and Animals*, as the English translation (Sydenham Society, 1847) has it. The tissue being in this way analysed into a cell-aggregate, that elaborate and detailed study of cellular forms and structures, development and modifications, which still mainly occupies the histologist, was thus fairly begun.

Finally, the description of the essential living substance of some of the lowest animal cells by Dujardin, and the similar account of vegetable cell-substance by Von Mohl, have directed attention from the cell to the all-important protoplasm of which it is composed. Here, of course, opens a new series of investigations, in which a basis for the study of organic structure is sought in the investigation of protoplasm. No deeper analysis is possible, without passing out of morphology altogether into chemistry and physics; and we are thus warranted in regarding the preceding five great categories of morphological inquiry as exhaustive, although progress within each of these is still far from ended. It must not be forgotten, indeed, that especially since the establishment of the last two of these categories (cell and protoplasm) we have had a new light cast upon all five through the study of development, with which names like those of Von Baer, Kölliker, and others, are so imperishably associated. Thus we can now trace not only the origin and differentiation of the cell itself, but that of the tissue, the organ, and the organism, from the ovum or primeval cell. Recognising, however, this general indebtedness to the embryologist for elucidating, under the actual facts of being, their mode of *becoming*, we may still classify the labours of morphologists as being essentially continuations of the five fundamental classics above mentioned.

(b) *Physiology*.—The early physiology was a matter of very vague and often mystical interpretation of the processes of the body, as phrases like those of 'animal spirits' and 'vital spirits' still survive to show. At best it was broadly little more than a superficial account of habit and temperament, which, although corresponding to the observation of general form later inaugurated by Linnæus, had yet little of the order and definiteness of this. The progress of anatomical research could not, however, fail to suggest that many vital processes were associated with definite organs or systems of organs, and the analytic study of physiology may be thus regarded as beginning with Harvey's memorable demonstration of the circulation of the blood. The study of the functions of each organ, viewed as a whole, long continued to form the sole problem of physiology. The illustrious Bichat was, however, no less a physiological than a morphological thinker; and in the physiological portion of his

Anatomie Générale, function was referred from the organ as a whole to the fundamental properties of its essential tissue. He thus not only deepened both morphology and physiology by a new analysis, but showed them to coincide; and in this way we come to understand how he so early clearly reached the conception of a unified science of biology.

With the advent of the cell theory, function, which had thus been referred from organ to tissue, had of course next to receive a yet deeper interpretation in terms of the constituent cells of these. Cellular physiology and pathology were clearly foreseen by Goodsir, and soon developed by Virchow and his school. Yet the interpretation of function in relation to structure, which had been successfully undertaken at each deepening level, began even at this one to break down. Attention came to be directed to the nature of protoplasm, and physiology, as Foster expresses it, thus began to undergo 'a change of front.' For the physiologist has now to view the problems of function of organ, tissue and cell alike, as outcomes or accompaniments of the destructive and constructive molecular changes (*metabolism*) of its protoplasm, of the physical and chemical processes of its waste and repair, its *katabolism* and *anabolism* respectively. This ultimate school of physiology may be headed by the works of the late illustrious Claude Bernard.

It is a fact of no little significance that these two independently deepened lines of research, morphological and physiological, are accurately parallel, stage for stage; not a little remarkable that the two sub-sciences of morphology and physiology should have independently undergone a precisely similar evolution. The result of our survey may in fact be conveniently illustrated by means of a couple of similar bookcases—one for morphology, the other for physiology—the shelves of each being allotted, in descending order, to the literature of the structural and functional aspects respectively of organism, organ, tissue, cell, and protoplasm, and each shelf being headed by its initial classic. To this biological pentateuch, of morphology and physiology respectively, each set of subsequent researches must be simply regarded as commentary or appendix. For since not qualitatively distinct, the originality of these is simply of a quantitative order. And if we imagine these cases, instead of being placed side by side as in the diagram, to be situated back to back, we have a yet clearer image of the completeness of their parallelism, as well as of the way in which they have independently been filled by workers approaching from quite different sides.

MORPHOLOGICAL	ASPECT OF	PHYSIOLOGICAL
+ Linnæus	Organism.	Hippocrates +
+ Cuvier	Organ.	Harvey +
+ Bichât	Tissue.	Bichât +
+ Schwann	Cell.	Virchow +
+ Dujardin	Protoplasm.	Bernard +

(c) *Evolution*.—Where, however, it may be asked, is the position on such a scheme of the literature of

evolution? The reply of course is, that like the conception of individual development of form and function, that of racial development does not lie upon any one level, but equally below them all. The evolutionist, like the embryologist, of course considers form and function in process of continuous change, while the morphologist or physiologist views them as constant at any given moment. Hence the diagrammatic representation of our evolutionary conceptions would lie in another plane; its literature might indeed be placed on the same shelves, but behind the volumes occupying them. The history of the doctrine of evolution, like that of embryology, may therefore more conveniently be treated separately (see EMBRYOLOGY, EVOLUTION), while the subject of distribution, not being a department of pure biology at all, but rather of geology and physical geography, does not enter into the present discussion (see DISTRIBUTION).

4. *Nature and Origin of Life*.—It is by this time sufficiently clear that the biologist is solely concerned with the positive facts of living nature, and is seeking only verifiable generalisations. He accepts the relativity of all scientific knowledge, and has long been wholly freed from alchemist-like dreams of reaching any 'vital essence' or ultimate secret of life other than that of a classified and unified account of its phenomena. The history of speculation as to the ultimate nature of life may therefore be conveniently relegated to a separate article (see LIFE), in which the various attempts to define it will be found: for actual biological purposes, the life of an organism is simply the sum of its functions, internal and external; nor need any other working conception be desired, if we agree that the ideal of organic life, that of a maximum of healthy function, implies the harmonised yet progressive adaptation of function and environment. Similarly, the history of speculation as to the unknown origin of life is separately discussed (see SPONTANEOUS GENERATION); while such actual knowledge as we possess respecting the structural and functional properties and characteristics of living matter is summarised under PROTOPLASM.

5. *Place of Biology among the Sciences*.—While no special account of the logic of biology is required, save that its study demands 'observation and experiment, comparison, classification, and historic filiation'—in short, all the powers of the scientific intelligence—its relation to other studies is a matter of more serious dispute. The essential problems, briefly stated, are: (1) How far and in what way the phenomena of biology are interpretable by and related to those of chemistry and physics; (2) How physiological phenomena are related to mental ones. The reply which is offered to these questions by many biologists may be best stated in two quotations from Huxley: 'Considered apart from the phenomena of consciousness, the phenomena of life are all dependent upon the working of the same physical and chemical forces as those which are active in the rest of the world. . . . A mass of protoplasm is simply a molecular machine of great complexity, the total results of the working of which, or its vital phenomena, depend on the one hand upon its construction, and on the other upon the energy supplied to it; and to speak of "vitality" as anything but the name of a series of operations, is as if one should talk of the "horology" of a clock.' Again, 'the biological sciences are those which deal with the phenomena of living matter, and though it is customary and convenient to group apart such of these phenomena as are termed mental, and such of them as are exhibited by men in society under the heads of psychology and sociology, yet it must be allowed that no natural boundary separates the subject-matter of the latter

sciences from that of biology. Psychology is inseparably associated with physiology, and the phases of social life exhibited by animals other than man fall strictly within the province of the biologist.'

From these positions the transition is easy to the dogmatic materialism of writers who look forward to completely reducing functional and psychical processes to chemico-physical ones. But it has long been pointed out that the functional states and changes which we call physiological, and the mental states and changes which we know as psychological, have each their own definiteness and continuity. Motions are continuously traceable to antecedent motions, which may be termed their causes; nor is there any hiatus at which 'vitality' or the like can be inserted; similarly, however, changes in mentality are preceded by antecedent changes of mentality; which are equally entitled to be termed their causes. A comparison of the two streams shows indeed a definite parallelism between them; so that we constantly interpret one by the other. Feature, voice, and gesture are thus familiarly regarded as the 'expression' of psychological states, while the physician constantly ascertains the state of function by inquiring into the feelings of the patient. As, moreover, he next verifies this by a physical and chemical diagnosis, we become convinced of a complete constancy or parallelism of normal and pathological relations between chemico-physical changes, organic functions, and psychic states. The materialistic interpretation—i.e. of the latter two in terms of the first—is, however, as Comte has especially insisted, as unverifiable as would be the converse transcendental one. The links of the argument that physical changes set up the mental ones, may with equal strength be placed in precisely reverse order, to prove that psychic changes set up the physical ones. Given in fact these three orders of phenomena, physico-chemical, biological, and psychic, the labours of physiologists have done great service in establishing detailed parallelism between all these processes, yet leave the original distinctness of each category unimpaired. We can not only correlate the digestive process with normal psychic states of hunger and satisfaction, but define its physico-chemical constants, and even experimentally reproduce these in our test-tube outside the organism altogether. In a definite and very important sense, therefore, we can now say that we understand digestion in terms of chemistry and physics; but this advance of our physiological chemistry is apt to produce serious misunderstanding when it prevents the chemist from seeing that his biological colleague is not ultimately concerned with the action of the acids and ferments, in terms of which the chemical 'explanation' of digestion is expressed, but with digestion as one factor of his biological unity, the organism—as one process of its 'life'—i.e. of its adjustment of internal and external relations, a complex process with which no test-tube can present the slightest parity. Similarly, the psychic state accompanying digestion, whatever its precise physico-chemical and functional concomitants (although it is of course most interesting and desirable to define these), is only truly known by reference to the whole succession of phases or forms of mentality, which it is the problem of psychology to analyse and classify. It similarly, therefore, eludes all attempt at expression in terms of the contents of our test-tube, unless, indeed, we go so far as to endow this or its contents with specific mentality as well: this, however, would of course be an unverifiable hypothesis of transcendentalism, not a scientific materialism at all. In short, then, the physiologist is entitled to say that he knows of 'no thought without phosphorus,' but by no means that 'the brain secretes thought as the liver does bile.'

Again, since in sociology our problem is of social aggregates, the study of the individual may and does indeed furnish the most valuable data, but our ultimate sociology—i.e. our generalised and unified science—is concerned not with the individuals but with the essential drama of the race. The final *reductio ad absurdum* of the crudely materialistic position is afforded by pushing it to its logical consequence, for if, as we see many disposed to think, social phenomena fall truly within the province of the biologist, and this be but the interpretation of molecular machinery in terms of chemistry and physics, then the ultimate generalisations of sociology, the philosophy of history, would have to await elucidation by the organic chemist! It will thus be sufficiently clear that the parallelism which we are constantly establishing between all orders of phenomena, physical and biological, biological and psychological, or these and social, and which we may define as the province of a legitimate materialism, in nowise interferes with that claim to the unity and distinctness of each of these sciences, which remains as the stronghold of an equally legitimate transcendentalism.

6. *Generalisations of Biology.*—But while all these provinces of the science must be separately discussed, their results demand unification. It must not be forgotten that science, no less than music, is to be distinguished from its printed records, and even from our power of recollecting its details piecemeal. For the measure of our grasp of biology lies in our power of simultaneously orderly presentment of its whole body of essential truths before our minds, and such a breadth of synthetic vision, although demanding an exceptional effort, is becoming at least partially possible.

If we thus attempt to reach the largest possible general view of the science, we have evidently not only to unite the results of the morphological and physiological study of the organisms before us at the present moment, but to introduce the conception of past, indeed also of future time as well. This entire drama of organic existence is what we have now learned to call its *evolution*; and consequently, since this supreme generalisation has been clearly laid hold of by the students of separate sub-sciences, these have been well-nigh transformed. Their unification and detailed progress have alike made enormous advances, and we are thus rapidly approaching a unified and systematic account of organic nature.

Within the present limits only the merest outline of this synthetic view can be attempted. Starting once more at the rise of modern botany and zoology, we see the naturalists of the renaissance slowly disencumbering themselves of the literature of mere medieval traditions distorted from the classic past, which did duty for natural history, and returning to nature. We watch the rise of the systematic movement from Ray to Linnæus, and thence trace its extending exhaustiveness, aided by new appliances like the deep-sea dredge and the microscope, new facilities like the marine station and the exploring expedition, and carried on by an ever-increasing multitude of workers. Accepting this catalogue of organisms, which, though still incomplete, is now for most purposes far more than adequate, we have next to sum up each of the successive planes of morphological and physiological research, and seize the results of the scrutiny and comparison of the form and function of organs, tissues, cells, and protoplasm of the multitude of organisms which have now been submitted to this detailed analysis. An attempt at the synthetic presentation of this must set out from the Protoplasm (q.v.), which is the 'common denominator' or 'physical basis' of life. Here we have to acquaint ourselves with the conditions of its

existence, and take note of the physiologist's enumeration of its functions as 'contractile, irritable and automatic, receptive and assimilative, metabolic and secretory, respiratory and finally reproductive' (see PROTOPLASM).

The study of the unit-mass of protoplasm or cell should next be summarised, its varied forms surveyed and classified from the simplest to the most complex and many-celled plants and animals, and these generalised into the conception of a simple 'cell-cycle,' ranging between a more or less passive and encysted spheroidal form to a less or more motile (amoeboid or elongated) one. The phases of cell form are also seen to arise as so many stages of the rhythm between growth and waste (anabolism and katabolism) into which, as we have seen above, all functions are finally summed (see CELL). The simplest organisms are separate unit-masses of protoplasm, of which the life-history essentially coincides with the cell-cycle aforesaid (see PROTOZOA). In higher but still unicellular forms, the resting or the motile phase becomes more and more permanent and specialised, and a distinctly plant or animal character thus makes its appearance. Multiplication soon becomes habitual at some one definite phase, and instead of the separation of the resultant portions to lead an independent life, we at length have their continued union. Such a union of normally resting cells gives us the multicellular plants or *Metaphytes*; that of normally amoeboid cells, the multicellular animals or *Metazoa* (q.v.). By the more passive vegetable organism the energy of the sun's rays is usually absorbed by aid of a green colouring matter (Chlorophyll, q.v.), and applied to the reduction of the carbonic acid of the atmosphere, starch and cellulose being also normal products, while their nitrogenous matter is obtained in solution as ammonia or nitrates. On the other hand, the more active animal is dependent for its nitrogenous food on proteids already directly or indirectly worked up by the agency of plants, and also for its carbonaceous on organic substances, starch, sugar, fat, &c.

Of the multicellular plant or animal only a few cells remain comparatively undifferentiated to form the reproductive elements. In these that alternate or permanent preponderance of katabolism or anabolism, which is a constitutional feature of the adult life of the great majority of living beings, usually specially asserts itself; and we have thus the development of those motile and resting forms which are henceforth respectively characteristic of the male and female 'sex' (ovum and spermatozoon). See REPRODUCTION, SEX. After a more or less distinct 'rejuvenescence' of the primeval cell-cycle, usually accompanied by that complete union with a cell of contrasted sex which we term fertilisation, the resultant cell (fertilised ovum) undergoes segmentation into an embryonic mass (see EMBRYOLOGY). From this a new adult organism gradually develops. In the animal this embryonic sphere becomes dimpled into a two-layered sac, the primeval stomach or 'gastrula'; a third intermediate layer arises, and from these three certain definite organs constantly develop. The outer furnishes the epidermis, nervous system, and sense organs; the inner layer the alimentary canal and its appended glands; and the middle one the skeletal, muscular, excretory, and reproductive systems. This unit of origin gives us a starting-point for identification of like organs in different animals, and the fertile study of *homology* thus begins. Again, this development of at first similar cell-unions into tissues and organs is readily explained as a consequence of the division of labour in the individual and in the race. The associated units have their activities restricted in one way or in another, and their energies find new outlets varying with their special

circumstances. Function establishes structure, and these gradually perfect each other; the *tissue* is thus formed, and by-and-by becomes rounded off or combined with other tissues into a definite mechanism, the *organ*, while these may form a still larger unit, the *system*. It is therefore the development and complexity of this physiological progress of division of labour which determines the special and general form of the organism. We thus see how the results of pure morphology (anatomy without regard to physiology) acquire a rational explanation by reference to the physiological processes which shape organic forms. With increasing complexity of structure we have necessarily an increasing simplicity of function, for the many processes at first crowded into a single cell become, so to speak, sorted out into the different organs. Residual traces of all these protoplasmic properties must, however, remain in varying measure in even the most specialised of living cells, hence the possibility of functional change is never closed, since use, disuse, or changing circumstances may set up a renewed increment of any one or a continued decrement of any other of these minor processes, however apparently suppressed. Here in this latent potency of change we have in short the rationale not only of the cell-cycle with which we set out, but the explanation of the otherwise mysterious phenomena of reversion and progression—in fact, of the occurrence of all variations, normal or pathological alike. See PHYSIOLOGY, PATHOLOGY, VARIATION.

It is clear that this specialisation of organs involves their dependence upon each other, and that if one suffer or develop, this must affect all its partners in the general life. Hence we obtain 'correlated variations,' and interpret the various symptoms of a given disease. Progress as regards organs is thus twofold—(1) in continued development and increased division of labour of the parts (differentiation); (2) in increasing correlation of the parts to each other and in subordination to the whole (integration). And when we note that any higher integration depends upon a preceding new differentiation, which of course disturbs the existing equilibrium of the whole, we are in a position at once to comprehend the beginnings of disease, and to realise that the traditional pessimistic interpretation of this admits of important modification.

A strict classification of the organs is rendered difficult by the varied ways in which different organisms have solved the problems of adaptation: a general correspondence to those essential properties of protoplasm which we noted at the outset is of course observable, since the frog has no functions which were not foreshadowed in the amoeba. The older physiologists, however, clearly pointed out that the primary classification is that which separates the reproductive or species-regarding functions from the remaining individual ones; while the latter are again divisible according as they are concerned with the internal problems of the organism—i.e. with nutrition (also circulation, mechanical support, &c.) or with the external problems of relation to the environment (sensory, nervous, muscular). These fundamental contrasts between reproduction and individual development, and between the vegetative and the animal functions, are in fact the largest physiological features of organic nature, and admit of fruitful application (see VARIATION) to interpret the endless details of plant and animal form and life.

Returning to these, which we are now in a position to view as an ordered whole, we find that (a) the successive appearance of related types upon the globe broadly (and sometimes even minutely) corresponds to (b) the order of increasing complexity established on purely anatomical grounds, while

the embryologist (c) finds that the development of the individual from its unicellular simplicity to adult complexity repeats the same essential succession of phases. This threefold coincidence next demands explanation, and the 'theory of descent' from a flora and fauna of increasingly simpler character in the past necessarily makes its appearance; nor has any other scientific explanation been suggested. But this modification during descent next demands explanation; a problem of supreme difficulty which has had many attempted answers.

From all these repeated attempts to discern the principle of organic progress, the naturalist has been learning to change the static or anatomical view of living nature for the dynamic and physiological one—in other words, to rise from the analysis of the individual as a dead specimen to the conception of the species as a living whole. The commanding superiority and wide scientific influence of Darwin among naturalists are of course popularly, though groundlessly, associated with the origin instead of the final popularisation of the conception of descent; while even by scientific men they are frequently assumed to be essentially associated with his particular hypothesis of natural selection as the rationale of progressive modification; yet his biological influence and example primarily depend on his having fairly established in practice this great transition from the pursuit of dispersive specialisms towards attempting a general view and explanation of organic nature. Since his time, our knowledge of the plant can no longer be grouped round the dried herbarium specimen of it, as had been the case since Linnæus' day. It has become again for us a living being, not only breathing, and growing in the sun, but moving, digesting, sensitive, often in a measure hardly second in its fullness to that of animal life—in a word, the dryad of old poetry has been recalled to life by modern science. The individual, too, has wide relations, here it may be to other plants, here to insects, there to birds and beasts: the entomologist must leave his museum, and the botanist his herbarium, to work out in the garden together the steps by which insect and plant have wrought out each other's form and destiny: they have soon to call in other specialists to their aid; and the world thus comes to be understood as a vast and complex web of life, and its many forms as related to each other by innumerable complex ties. Thus the farmer's cat influences his clover crop, or the distribution of a particular insect determines alike the civilisation and the scenery of vast regions of Central Africa. In this way the unit-problem of the science has become no longer the description of the isolated specimens of its index collections, but the history of the entire species in its living relations, actual and historic. See ECOLOGY.

Since the doctrine of natural selection, which is the more immediate contribution of Darwin and his school to the theory of evolution, will be found summarised under DARWINIAN THEORY, and discussed under EVOLUTION, it suffices here to point out that, despite its wide applicability and indisputable services, its finality is again becoming disputed by various naturalists on different grounds (see EVOLUTION, VARIATION). On one side the older explanations, in terms of use and disuse, environment, &c., are being revived; while on another, it is being attempted to replace the received doctrine of indefinite variation, with progress by means of struggle for existence among individuals, by the conception of definite variation (even pathological), with progress essentially in the measure of the subordination of individual struggle and development to species-maintaining ends, reproductive, domestic, or associative. Without entering into details, it is evident that such a

restatement of the theory of the evolution of living beings—in terms no longer primarily of strength and competition, of hunger and battle, but of love and co-operation, of sacrifice and pain—would involve, no less fully than has the doctrine of struggle for existence, a deepened reinterpretation of plant and animal life, and would similarly extend into other fields than those of pure biology.

7. *Conclusion—Biology and Practical Life.*—While biology as a science finds its source and justification in the natural impulse to contemplate, and reasonable desire to comprehend the world and our place in it, its action and reaction with practical life requires brief consideration. Our knowledge of animals, like the child's, obviously arises with their chase; and that of the aspects and properties of plants, wholesome and poisonous, perhaps even medicinal, with the hungry search for roots and berries. The evolution through higher social states finds its reflection in widening zoological and botanical folklore, and the developed agricultural conditions of civilised life not only admit of the increasing and systematising of our knowledge, but even at length contribute valuable conceptions, like that of selective breeding, of which Darwin has made such especial use. The recent contributions of biology to the arts of life have been of course primarily associated with the advance of medical treatment; hence the popular and even medical conception of the botanist is still based upon the traditional one of the herbologist in quest of specific remedies. The increase of food-supply, through pisciculture and breeding, and through the destruction of the enemies of useful species, is an application of more recent but widening growth; in fact those applications of our knowledge of cryptogamic pests which have especially culminated in the labours of Lister and Pasteur (see GERM THEORY), at present furnish the stock illustration of the applicabilities of pure biology. New ideas are also germinating; thus speculation is busy—e.g. with schemes of artificial human selection; while rapid progress is being made in the transition from detailed medicine to wholesale hygiene—i.e. beyond the mere application of specific remedies to morbid individual variations, and towards a progressive and harmonious reorganisation of the functions and environments which are afforded by the human hive or city to its individuals. For the task of biology applied as hygiene should not only be to subdue the tendencies to morbid variations, but to determine that maximum of optimum life-cycles, which is the biologist's and hygienist's concrete rendering of the greatest happiness of the greatest number. And as the twin scientific motives of childlike curiosity, with its analytic pursuits, and of maturer contemplation, with its synthetic aims, become balanced by the corresponding practical ones of the arts and their application to the general humanist problem just outlined, our biological science and art may be fairly expected to react more and more fully in their associated yet alternate progress.

This hope is indeed confirmed by the whole past history of the science; with a glance at which in its most general aspect the present article may fitly conclude. At the very outset (§§ 1, 3) we saw that biology is no mere isolated stream of fortuitous discovery; next (§ 5), that it is no mere separate discipline which can be exhaustively pursued apart from other sciences; and—now (§ 7), that it has arisen from, and constantly returns to, ordinary life and practice. In tracing the progress of biology, we are simply following the reflection of the changing lights cast upon the organic world by each prevailing mode of general thought and social life. In a word, the evolution of biology forms part of the general social evolution; the science is no

completed body of truth, but merely such portion of it as our stage of social progress enables us to see. Else the rise of science from art would be little more than an almost prehistoric process, instead of being still and continually going on. Innumerable instances, large and small, might be given of this; thus, the classificatory doctrine of the 'échelle des êtres' (see ZOOLOGY) due to the naturalist Bonnet, is far more than a mere detail of the biographical history of zoology; for the conception of an unbroken series of beings ascending in regular gradation from the lowest up to the highest is obviously the projection upon nature of that established ecclesiastical and social hierarchy in which the good abbé's mind was formed. Again, taking a larger instance, the substitution of Darwin for Paley as the chief interpreter of the order of nature is currently regarded as the displacement of an anthropomorphic view by a purely scientific one: a little reflection, however, will show that what has actually happened has been merely the replacement of the anthropomorphism of the 18th century by that of the 19th. For the place vacated by Paley's theological and metaphysical explanation has simply been occupied by that suggested to Darwin and Wallace by Malthus in terms of the prevalent severity of industrial competition, and those phenomena of struggle for existence which the light of contemporary economic theory has enabled us to discern, have thus come to be temporarily exalted into a complete explanation of organic progress.

Finally, the division of labour having become fully established in industrial practice, and recognised in economic theory by Adam Smith, it was frankly borrowed for biological application by Milne-Edwards, almost a couple of generations later, with fruitful results. This industrial development has indeed not only given us our present clear conception of separate organic functions, where an earlier school could see only their general resultant as 'temperament,' but it has also determined the prevalent intensity of scientific specialism within artificially restricted fields. Hence too, the extreme specialist's not infrequent loss, if not indeed denial, of definite responsibility to the science as a whole, and still more to that larger progress of which it forms a part, is simply the equivalent of that loss of conscious relation both to the special task and to its general bearings, from which at present the labourer also so frequently suffers. But as we progress with the synthetic reorganisation and practical application of the science, we may anticipate the recovery of both.

The manifold importance of biology in education is seen not only in its practical applications in the arts and in the study of medicine, but as a potent agency of culture, and as preliminary to psychological and social studies. See BOTANY.

Literature.—See, beside articles mentioned above, LAMARCK, SPENCER, WEISMANN, &c.; also Comte, *Philosophie Politique*; Robin, *La Philos. Pos.*; Laffitte, *Revue Occidentale*, 1.; Spencer, *Principles of Biology* (1866); Haeckel, *Generelle Morphologie* (1866); Huxley, *Anatomy of Invertebrate Animals* (1878); text-books by J. R. A. Davis (1888), R. J. H. Gibson (1889), T. J. Parker (1891), H. G. Wells (1893); J. Arthur Thomson, *The Science of Life* (1899); Alfred Earl, *The Living Organism* (1899); Rädcl, *Geschichte der Biologischen Theorien* (1905-9).

Bion, one of the three Greek bucolic poets, was born near Smyrna, but settled in Sicily, where he is said to have been poisoned by a jealous rival—probably a poetic fiction. He imitated his earlier contemporary Theocritus; the author of the 'Lament for Bion' calls himself his pupil. Little of his work has survived save his 'Lament for Adonis.' His works are usually edited and translated with those of Theocritus (q.v.).—BION OF BORYSTHENES flourished about 280 B.C. At first a Scythian slave,

he studied philosophy at Athens, and afterwards lived at the court of Antigonos Gonatas.

Biometrics, the statistical study of living organisms, has thrown much light on Variation and Heredity (q.v.). See *Biometrika*, and writings of Galton, Pearson, Weldon, D'Arcy Thompson.

Biot, JEAN BAPTISTE, a distinguished French physicist and astronomer, born at Paris, April 21, 1774. He entered the artillery, but forsook the service for science, and in 1800 became professor of Physics in the Collège de France. Along with Arago (q.v.), he was (1806) sent to Spain to carry out the measuring of a degree of the meridian, and in 1817 he visited England, and went as far north as the Shetland Islands, in order to make observations along the line of the British arc of meridian. His most valuable contributions to science are on the polarisation of light, for which he received the Rumford gold medal in 1840; his researches into ancient astronomy are also very valuable. Among the latter may be mentioned his *Recherches sur l'Ancienne Astronomie Chinoise* (1840) and *Études sur l'Astronomie Indienne* (1862). His works on physics are still esteemed; the 3d ed. of his *Traité Élémentaire d'Astronomie Physique* (5 vols. 1841-57) was translated into English. In 1849 Biot was made a Commander of the Legion of Honour; he was also a member of the French Academy, and of most of the learned societies in Europe. He died at Paris, February 3, 1862.—His son, ÉDOUARD CONSTANT, a distinguished Chinese scholar, was born at Paris, July 2, 1803. He was at first a railway engineer; but his health failing, he retired from the public service, and devoted his leisure to the study of Chinese and the history of the social organisation of the Celestial empire. He was elected a member of the Academy in 1847, and died March 12, 1850. He wrote a *Dictionnaire de l'Empire Chinois* (1842), and a multitude of *Mémoires* on Chinese subjects.

Biotite. See MICHA.

Biped (Lat., 'two-footed'), a descriptive term, sometimes applied to man, but more frequently to birds. It may be used in two ways—(a) in reference to habit only (physiological), when animals use only their two hind-limbs for moving along the ground—e.g. man, kangaroo, bird; (b) in reference to anatomy (morphology), when the typical number of four limbs is reduced to two. Thus among mammals the order of whales (Cetacea) is marked by the absence of hind-limbs; among birds the fore-limbs are considerably reduced in the running birds of the ostrich sub-class, and especially in the New Zealand Kiwi (*Apteryx*); among reptiles, some serpents (e.g. Pythons) retain traces of hind-legs, while all the others have lost both pairs, and a few lizards have either only hind-feet (*Pseudopus*, *Ophiodes*), or only fore-feet (*Chirotes*); among amphibians, a few (e.g. *Siren*) have only fore-feet; and the same is true of numerous fishes (e.g. among Siluridae), and especially of those which live to a large extent in mud.

Bipinnaria, the technical name of a starfish larva. It is a curiously-shaped free-swimming form, with two ciliated bands, and with a tendency to develop long stilt-like arms or processes. It does not directly turn into the adult, but is only its 'nurse.' The adult is formed within the bipinnaria. See ECHINODERMS, STARFISH.

Biquadratic. See EQUATIONS.

Bir, or BIREJIK, a town of from 1800 to 2000 houses, of Asiatic Turkey, on the east bank of the Euphrates, 80 miles N.E. of Aleppo. Separated from Turkey by the Treaty of Versailles, it was restored by France—The Arabic *Bir*, which signifies 'well,' is the Hebrew *Beer*.

Birbhūm, a district in the Bardwan division of Bengal, with an area of 1752 sq. m. Rice is the chief crop. The principal exports are rice and raw silk. Pop. 935,000.

Birch (*Betula*), a genus of Betulaceæ, which forms with the Alder (q.v.) the Betuleæ tribe of that family, while the Hazel (q.v.) and the Hornbeam (q.v.) form the Coryleæ tribe. There are many species of birch, all trees or shrubs, natives of northern temperate and arctic regions.—The Common Birch (*B. alba*) has small, long-stalked, somewhat triangular doubly serrated leaves. It is a very beautiful and rapid-growing tree belonging to the cooler temperate, sub-arctic, and arctic regions. In favourable situations it attains a height of 50 to 60 feet, with a diameter of 1 to 1½ feet, but diminishes in size towards its arctic or alpine limit, at last becoming a mere bush. It is for this special reason a most important tree of Northern Russia, &c., where it often forms whole woods. No other tree exists in Greenland; and according to old popular belief, it was the only tree that grew in paradise. The bark is smooth and silvery white, and its outermost layers are thrown off as the tree advances in age. The smaller branches are very slender and flexible, and in a particularly graceful variety called the Weeping Birch (*B. A. pendula* of nurserymen), they are still more slender, elongated, and pendulous. The bark and leaves of the birch are, in some northern countries, used medicinally in cases of fever and eruptions. They are also used for dyeing



Flowering Branch of the Common Birch.

yellow. The bark is sometimes used for tanning, and for steeping nets, sails, and cordage (see BARK FOR TANNING). It is in some countries made into shoes, hats, drinking-cups, &c., and is even twisted into a coarse kind of rope, and is the material of which the North American Indians made their light canoes. It is remarkable for its durability, which often exceeds that of the wood itself. In many parts of the north of Europe it is used instead of slates or shingles by the peasantry; and in Russia—the outer or white layers being subjected to distillation—there is obtained a reddish empyreumatic oil called Birch Oil, of which a somewhat tarry form, the so-called *degutt* or *degget*, is employed in the preparation of Russia leather. Dried, ground, and mixed with meal, birch bark is used in Norway for feeding swine; and in times of scarcity has even served for human food. The wood is white, hard, and tough, and is employed by turners, wheelwrights, and coopers, who use it in the manufacture of barrels for fish. Much of it is made into charcoal for forges. The twigs are in general use for besoms, and for removing the scale from armour-plates in foundries. In Britain there are two varieties of the Common

Birch (*B. alba*); one with warty twigs (*B. alba verrucosa*) is usually found on dry soil, and the other with pubescent twigs (*B. alba pubescens*) generally on wet soil. The White Birch of North America (*B. populifolia*) very nearly resembles the common birch, and is also extensively used. The Black Birch of the same country, but of more southern range (*B. nigra*), also sometimes called Red Birch, produces very hard and valuable timber. But the name Black Birch is also given to another species sometimes called the Sweet Cherry Birch (*B. lenta*), itself a large and valuable timber-tree. Its leaves make an agreeable tea. The Yellow Birch of Nova Scotia, Maine, &c. (*B. excelsa*) is a large tree with leaves 3½ inches long; its timber is used in shipbuilding. The bark of the Paper Birch (*B. papyracea*) is capable of division into very thin sheets, which have been used as a substitute for paper. It is used by the Indians and French Canadians for canoes, boxes, buckets, baskets, &c. Large plates of it are curiously stitched together with the fibrous roots of the White Spruce, and coated with the resin of the Balm of Gilead Fir. *B. occidentalis* is an interesting species found on the Pacific slope. The mountainous districts of India also produce several useful species. Thin, delicate plates of the bark of *B. utilis*, Don., are used for lining the tubes of hookahs, and were formerly used as paper. *B. alnoides*, Ham., a native of Nepal, has strong and durable wood.—The Dwarf Birch (*B. nana*) is a mere bushy shrub, seldom more than 2 or 3 feet high, and generally much less. It has orbicular crenate leaves. It is a native of the whole of the most northern regions of the globe, and is found as far south as the Highlands of Scotland. It is interesting because of its uses to the Laplanders and other inhabitants of very northern regions, to whom it supplies their chief fuel, and the material with which they stuff their beds. Its seeds are the food of the ptarmigan, on which the Laplanders in a considerable degree depend. A similar shrubby species (*B. antarctica*) occurs in Tierra del Fuego.

Birch, SAMUEL, Egyptologist, was born in London, 3d November 1813, the son of a city clergyman. Educated at Merchant Taylors', in 1834 he entered the public service under the Commissioners of Public Records; and in 1836 he became assistant in the antiquities department of the British Museum. In this capacity, Birch acquired an extensive acquaintance with archaeology in all its branches. He studied not only Greek and Roman antiquities, including numismatics, but applied himself with untiring zeal to Egyptian hieroglyphics. In process of time, he so distinguished himself in this difficult branch of learning, that Baron Bunsen availed himself of Birch's knowledge in the philological portion of *Egypt's Place in Universal History*, the last volume of which, after Bunsen's death, was admirably edited by Birch. In 1844 he was appointed assistant-keeper of antiquities; in 1861, keeper of the Egyptian and Oriental antiquities. He received an honorary LL.D. from St Andrews in 1862, and from Cambridge in 1874, in which year he was president of the London Congress of Orientalists. He was a corresponding member of several academies, and was a contributor to various learned journals, to the *English Encyclopedia*, and to *Chambers's Encyclopedia*. Besides three works connected with his Chinese studies, he was author of *Ancient History from the Monuments of Egypt* (1875), *Egyptian Texts* (1877), &c. He died in London 27th December 1885.

Birch, THOMAS, D.D., an industrious historical writer, born at Clerkenwell in 1705, was the son of

a Quaker, but in 1730 took Anglican orders, and received half a dozen preferments in the course of the next thirty years. He was killed by a fall from his horse in the Hampstead Road, 9th January 1766. He was author or compiler of *Lives of Boyle, Tillotson, Queen Elizabeth, Prince Henry, &c.*

Birch-Pfeiffer, CHARLOTTE, a German actress and dramatist, was born at Stuttgart in the year 1800. She made her debut at Munich at the age of thirteen, and afterwards played with great success at Berlin, Vienna, and Hamburg. In 1825 she married Dr Christian Birch of Copenhagen, and in 1837, after performing at Petersburg, Pesth, Amsterdam, and other places, she undertook the management of the theatre at Zurich. At a later period, she acquired even greater renown as a writer for the stage than as an actress. In 1843 she made an engagement with the theatre-royal at Berlin, in which town she died, August 24, 1868. Madame Birch-Pfeiffer's plays attain no very high standard, but are still popular with German audiences. A complete edition of her dramatic works has been published in 23 vols. (Leip. 1863-80), and of her novels and tales in 3 vols. (1863-65).—Her daughter is Wilhelmine von Hillern (born 1836), author of *Die Geier-Wally* (dramatised by her, 1881) and other novels.

Bird. Birds are in some ways the highest of the vertebrate animals. They represent the climax of that passage from water to land which the backbone series illustrates. Their skeleton is more modified from the general type than that of mammals; their arrangements for locomotion, breathing, and nutrition are certainly not less perfect; their body temperature, higher than that of any other animals, is an index to the intense activity of their general life; their habitual and adaptive intelligence is familiarly great, while in range of emotion and sense impressions they must be allowed the palm. It is, in fact, only when we emphasise the development of the nervous system and the closeness of connection between mother and offspring, that the mammals are seen to have a right to their pre-eminence over birds. Birds and mammals represent two divergent lines of progress, and stand in no close connection, but the affinities between birds and reptiles are sufficiently marked to warrant their being included in a common class (Sauropsida), in contrast to the amphibians and fishes (Ichthyopsida) on the one hand, and Mammalia on the other. Among the numerous points of difference which separate birds from their nearest relations the reptiles, and from mammals, the following may be noticed:

	Reptiles.	Birds.	Mammals.
Covering.....	Scales or scutes.	Feathers.	Hair.
Number of fingers.....	Always more than three.	At most three.	Five or fewer.
" skull condyles...	One.	One.	Two.
" aortic arches...	At least two.	One, right.	One, left.
Diaphragm.....	Only incipient.	Only incipient.	Complete.
Blood.....	Cold.	Hottest.	Warm.
Position of optic lobes...	On top of brain.	At sides of brain.	Covered up.
Parturition.....	Ovi- or viviparous.	Oviparous.	Except two, viviparous.

But those contrasts are only a few of the less technical selected from Professor Huxley's masterly comparison of the three classes. To appreciate the full extent of the resemblances and differences between birds and reptiles, and the contrast between both and mammals, the reader must consult Huxley's *Anatomy of Vertebrate Animals*.

History of Study of Birds.—As birds are even to a careless eye most markedly separated from all other animals, there has rarely been any difficulty about the limits of the class. Aristotle (300 B.C.) defined them as feathered flying bipeds which lay eggs, and catalogued a goodly list, divided into three great orders, with the ostrich and a few others in separate subdivisions. He did not include bats in his list. For eighteen centuries no real progress was made with the study of birds. They were not of course lost sight of, but were abundantly discussed, now from a semi-religious, now from a practical point of view, yet it was not till the outburst of naturalist enthusiasm in the 16th century that they became again objects of scientific study. It is indeed curious, after a lapse of 1800 years, to find William Turner describing the birds enumerated in the catalogues of Aristotle and Pliny. Of the school known as Encyclopædists, Bélon (1555) devoted himself especially to the study of birds, and made the great step of comparing the skeletons of bird and of man bone for bone. In the subsequent classificatory enthusiasm inaugurated by John Ray, and perfected by Linnæus, birds came in for a full share of attention, but the numerous naturalists who, towards the end of the 18th century, tried to put the birds in order, have left in their discrepant systems a record of the difficulty of a task which is still acknowledged to be bewildering. They fixed their attention mainly either on superficial characters, such as bills and feathering, or on general facts of habit, such as running and swimming. In other directions, however, progress was made: John Hunter (1728-93)

and Vieq d'Azyr (1748-94) made important investigations on the skeleton and musculature of birds, while Caspar Friedrich Wolff, turning in 1764 to the problem of chick-development, the study of which had begun in Greece more than nineteen centuries before, laid the foundations of modern embryology. Then followed the Cuvierian school of anatomists, and to the works of the master himself, and of his numerous disciples, most of our present knowledge of bird anatomy is due. Numerous attempts at classification were again made, but even yet no one detailed system is generally adopted. General ornithology has been greatly enriched by the monographic, and in some cases stupendous labours of enthusiasts like Naumann, Thienemann, Audubon, Gray, Wilson, Gould, Selater, &c. In recent years we are mainly indebted to Owen and Marsh for knowledge of fossil forms; to W. K. Parker for embryology; to Selater, Wallace, Newton, and others for distribution; and for a scientific classification to Professor Huxley.

Structure.—(a) With the general form of birds every one is familiar; the frequent length of the neck, the inconspicuousness of the fore-limbs when at rest, the length of the hind-limbs, the reduction of the tail, the boat-like form of the main body, the smooth gracefulness of the contour curves are at once evident. (b) As to the appendages, the modification of the fore-limbs for flight in the great majority of birds is the most marked characteristic. While the flying reptile, Pterodactyl, had a membrane stretched on the much elongated little finger, and the bats have their skin spread out between their elongated four fingers, the bird has never more than three fingers, and these much reduced. The stroke, as every one knows, is effected not by a stretched skin, but by the strong stiff feathers. The most marked general feature in the legs is the elongation and fusion of the bones just below the ankle (metatarsals).

The toes are never more than four, except in abnormalities, nor fewer than three, except in the two-toed ostrich. (c) The integument differs markedly from that of every other Vertebrate type in

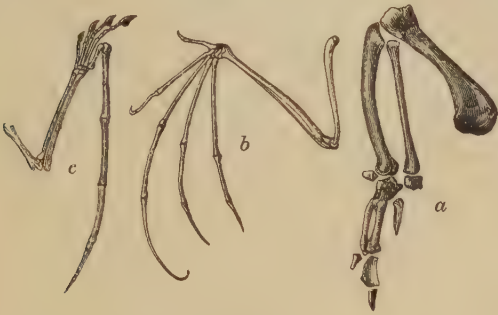


Fig. 1.

a, fore-limb of pigeon; b, fore-limb of bat; c, fore-limb of pterodactyl.

being clad with feathers. These are skin structures generally comparable to scales or hairs. Their development will be discussed separately (see FEATHER), but it may be noted that in consequence of certain conditions of skin growth, numerous elevations are formed both of the outer and inner layers. These growing outwards, and at the same time fixed below in little pits, become to a large extent horny, and are split up in various ways to form feathers. The outermost sheath becomes a horny case which falls off as the feather grows; the feather proper is due to a horny modification of the inner stratum of the outer skin or epidermis; the inner skin (*dermis*) forms a nutritive base which, with its blood-vessels, keeps the young feather alive, but becoming subsequently reduced, leaves the perfect structure virtually dead. They do not usually occur all over the body, but in definite feather-tracts, as can be readily seen by plucking small or young birds. Some birds, however, like the penguin are really feathered all over. Three distinct kinds of feathers are at once distinguishable—(a) the small hair-like downy rudimentary *filoplumes*; (b) the numerous smaller contour or covering *plumes*; and (c) the large strong quill-feathers or *pennæ* on wings and tail. The ordinary feather consists of a quill at the base of a shaft up the centre, and of the vane borne on the sides of the shaft. The vane consists of parallel barbs, which are linked together by small barbules. The base of the quill bears a miniature feather or after-shaft, which in a few cases becomes as large as the main feather. On the bare legs of many birds the feathers are replaced by horny scales, and the horny structures forming the beak and terminating the toes are very familiar. Skin glands, so abundant in mammals and elsewhere, are here absent; but at the very end of the tail there is a two-lobed oily preen-gland, the secretion of which is used by the bird for anointing and waterproofing its feathers. Curious skin structures, such as combs and wattles, are often developed.

Skeleton.—The most important peculiarities of the bird skeleton are the modifications of forelimbs and girdle in association with flight, the abundant air-cavities (only absent apparently in the kiwi or apteryx), which make the bones so light and spongy, and the tendency the bones have to fuse together. (a) The backbone is very different from that of other animals. The several backbone bodies (vertebræ) have a very complex shape, and are not to be mistaken for those of any other vertebrate. While the neck of mammals almost

always consists of seven vertebræ, that of birds includes a larger and variable number, amounting to over a score in the swan. Unlike the very movable neck, the dorsal region tends to become more or less rigid, especially behind, where a large number of vertebræ enter into immovable connection with the hip-girdle. Behind this there are a few caudal vertebræ which are again mobile, and end in a compound ploughshare-bone which bears the great steering feathers of the tail. The most anterior ribs are fused to the vertebræ; then follow a few (two in the fowl) which are free, but do not reach



Fig. 2.—Skeleton of Fowl (exhibited in section):

a, brain-cavity; b, hyoid bone; c, neck vertebra; d, clavicle; e, interclavicle; f, coracoid; g, breastbone; h, scapula; i, humerus; k, radius; l, ulna; m, wrist; n, thumb; o, united metacarpals; p, second finger; q, third finger; r, ribs; s, ilium; t, ischium; u, pubis; v, ploughshare-bone; w, femur; x, tibia; y, united metatarsals; z, separate metatarsal; 1, 2, 3, 4, toes.

the breastbone; the next set meet, at an angle, upward processes from the breastbone, with which they are thus indirectly connected. The last ribs are again free. Almost all the ribs bear backward directed (uncinate) processes which overlap the rib behind. These also occur in crocodiles.

(b) The skull of course corresponds in general structure to that of other vertebrates, but is distinguished by the early fusion of the component bones, so that the contours are no longer visible, by the prolongation of the front bones to bear the beak, by the absence of teeth, by the large sockets for the eyes separated from one another only by a thin (sometimes perforated) partition, and by the marked lightness of the bones. There is only one ball (condyle) which turns on the cup of the body of the first (atlas) vertebra, the bone (quadrate) on which the lower jaw works is movable, the portion of the skull lying in front of the eye-sockets is slightly movable on the portion protecting the brain, the tongue-bone (*hyoid*) is very well developed. It is on the relations of certain bones of the skull that Huxley bases his anatomical classification.

(c) The limbs.—The shoulder-girdle consists (1) of a long bone running backwards (the shoulder-blade or *scapula*), (2) of a shorter bone running from the shoulder down to the breastbone (the

coracoid, only a process of the scapula in mammals), and (3) of a slender collar-bone (*clavicle*) which extends from the shoulder to meet its fellow in front of the breast, forming with the broad uniting plate the familiar 'merrythought.' The *breastbone* or *sternum* forms the base of attachment for the great muscles which work the wings, it is concave internally, and in most birds bears a prominent ridge or keel on the middle line in front. As this ridge serves for the fixing of the flight muscles, it is largest in the birds which use their wings most, and absent in those, such as the ostrich family, which use them either not at all, or very little.



Fig. 3.—Breastbone and Shoulder-girdle of Falcon:

a, clavicle; b, scapula; c, coracoid; d, keel of sternum; e, ribs.

among birds of flight, comparative disuse of wings may be associated with a slight development of the keel. In the New Zealand parrot (*Stringops*), and a few more, the keel is very rudimentary. The arm consists as usual of a strong upper bone or *humerus*, working in the socket formed by scapula and coracoid, of two bones forming the forearm, the *radius* and the stronger *ulna*, of a single pair of wrist-bones, and of three fingers. The three bones corresponding to the palm of the hand (the *metacarpals*) are fused together, and also with the distal carpals, forming a *carpo-metacarpus*—i.e. half of the wrist and the whole of the palm. The thumb and first finger are sometimes clawed. In the kiwi and the emu there is only one complete finger, apparently the second. The feathers attached to the hand are usually called primaries, and those borne on the ulna, secondaries. The *hip-girdle* is very long, and its most important part consists of two dorsal bones (*ilia*) which are fused to a large number of posterior backbone bodies. A second

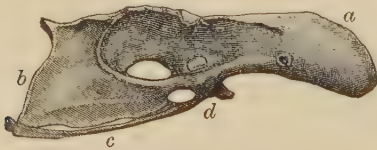


Fig. 4.—Hip-girdle of Fowl:

a, ilium; b, ischium; c, pubis; d, socket.

portion (the *ischium*) extends backwards on either side, nearly parallel to the hind part of the ilium with which it is firmly fused. The third part (or *pubis*) also runs backwards from the socket of the thigh, and is a slender bone nearly parallel to the former. Only in the ostrich (*Struthio*) do the two pubes really unite; but in other birds they are bound together by fibrous tissue. In the American ostrich (*Rhea*) the two ischia are united ventrally. The socket formed by the union of the three portions of the hip-girdle is incompletely bony (perforate), as is also the case in one of the lowest mammals, the porcupine ant-eater, or *Echidna*. The thigh (*femur*) is a short stout bone. It is followed by the two bones of the lower leg, one of which (the *fibula*) is always imperfect and fused to the strong *tibia*. The knee is generally protected by

a knee-pan or *patella*. The ankle is peculiar in this, that the upper tarsals unite in the adult bird with the lower end of the tibia, which is therefore known as the *tibio-tarsus*, while the lower tarsals unite with three of the bones corresponding to the sole of the foot (metatarsals), thus forming an absolutely characteristic bird bone, known as the *tarso-metatarsus*. In the adult there are thus no distinct ankle bones or tarsals, these having become fused to the tibia above, and to the three fused metatarsals below. If there are four toes, the first is turned backwards, and its metatarsal remains quite separate. But in many birds the first toe is wholly undeveloped. The



Fig. 5.—Feet of various Birds:

a, swift; b, stilt; c, black stork; d, wryneck; e, falcon; f, raven; g, kingfisher; h, pelican; i, grebe; k, coot; l, snew-duck.

ostrich has only two toes. In most cases the number of joints in the toes increases by one, from two in the first to five in the fourth toe. The toes vary considerably in direction according to the way they are used. A bony spur ensheathed with horn is sometimes developed (as in the cock) in connection with the metatarsus.

Muscular System.—The most important muscles of the bird are those which work the wings. These lie on the breastbone, which forms their base of attachment. The great pectoral muscle which forms the greater part of the breast *depresses* the wing; a second smaller and deeper muscle, covered by the former, is continued into a long tendon which passes through a hole at the shoulder-joint, is inserted on the back of the upper arm, and *raises* the wing; a third much smaller breast muscle also assists in elevating the wing. It is well known that birds may remain firmly perched when asleep. This is effected by an automatic muscular arrangement. The tendon of a muscle which bends the toes passes up to the hip over the knee-joint, so that when the knee is bent in perching, the tendon is stretched, and the toes are kept firmly fastened. There is a strong development of muscles in association with the gizzard or stomach-mill.

Nervous System.—The brain of birds is markedly more developed than that of reptiles, the parts no longer lie almost on one plane, and the organ occupies the whole of the spacious skull-case. The convolutions characteristic of the fore brain of mammals are not yet developed. The 'tween brain (*optic thalami*) is quite hidden, the mid brain (*optic lobes*) is thrust to either side, the hind brain

(*cerebellum*) exhibits cross grooves. There are twelve pairs of nerves given off as usual from the brain. The spinal cord exhibits in the hip region a conspicuous enlargement due to the divergence of its two sides. The *sense-organs*.—In association with their manifold experience, birds have well developed sense-organs. This is especially true of the eyes. They are large and powerful, and can be rapidly accommodated to different distances. They differ only in minor points from those of any vertebrate. The form is far from spherical, the front portion being protruded, and to a certain extent constricted off from the ball behind. A special ring of small bony plates protects the base of this anterior portion. A comb-like nutritive fold (*pecten*), absent only in the kiwi, projects from behind into the posterior chamber of the eye. A third transparent eyelid or nictitating membrane (not restricted to birds) is conspicuously developed, and can be drawn like a screen across the eye. It lies hidden in the anterior corner. Tear and other glands are present. The ear differs markedly from that of mammals in the absence of any external

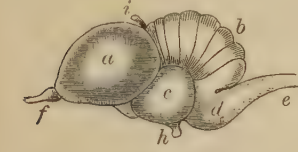


Fig. 6.—Brain of Pigeon:

a, fore brain; b, cerebellum; c, optic lobes; d, medulla oblongata; e, spinal cord; f, olfactory lobe; h, pituitary body; i, pineal gland.

cal, the front portion being protruded, and to a certain extent constricted off from the ball behind. A special ring of small bony plates protects the base of this anterior portion. A comb-like nutritive fold (*pecten*), absent only in the kiwi, projects from behind into the posterior chamber of the eye. A third transparent eyelid or nictitating membrane (not restricted to birds) is conspicuously developed, and can be drawn like a screen across the eye. It lies hidden in the anterior corner. Tear and other glands are present. The ear differs markedly from that of mammals in the absence of any external



Fig. 7.—Head of Falcon, showing beak, nostril, eye, and ear; opening exposed by removal of feathers.

portion. In the birds of prey, however, a membranous flap is present. The external opening is usually surrounded by a circle of fine hair-like feathers. As regards ear bones, only one (the columella) is present, and in this particular also the bird ear differs from that of mammals. The snail-like coil of the ear-cavity (the cochlea) is also much simpler. The (Eustachian) tubes which lead from the ear-aperture down to the mouth, unite before they open into the latter. The nostrils are usually situated at the base of the beak, but may occur further forward, and in the kiwi are situated at the very tip. In some cases they are guarded by bristles, in other cases prolonged into a tube, but are usually simple apertures. The nasal cavities may communicate with one another, and contain two or more gristly or bony scrolls. A peculiar nasal gland is present. The sense of smell is undoubtedly less developed than those of sight and hearing. Taste is also but slightly developed, and is discharged by the nerve terminations on the tongue, and by a soft patch of skin (*cere*) usually situated on each side of the base of the beak. In rare cases (e.g. in mud-grubbing birds) a much larger area of the Bill (q.v.) may remain soft and sensitive.

Alimentary System.—The character of the food-canal differs widely in different birds, varying with the nature of the food. Even in one bird the difference of food at different seasons, such as the change from fish to grain in the gull, may be

associated with a marked change in the nature of the stomach. The beak may be helped by the tongue in taking up food, but in the absence of teeth no real mouth mastication takes place. The tongue varies widely in form, being not unfrequently notched and rough, and varies in size from



Fig. 8.—Beaks of various Birds:

a, marabout stork; b, sparrow; c, boatbill; d, swordbill humming-bird; e, species of thrush; f, pelican; g, spoonbill; h, scissorbill; i, flamingo; j, avocet; k, boatbill stork; l, openbill stork; m, ibis; n, condor; o, merganser; p, *Columba aenas*; q, mycteria or saddle stork.

the rudiment found in the pelican to the long protrusible organ of the humming-bird. Salivary glands open into the mouth-cavity, which in some cases (e.g. pelican) is enormously distended, and can hold quite a store of food. The gullet is soft and elastic, in obvious association with the downward

passage of unmasticated food. In many birds it dilates into a spacious thin-walled sack, known as the crop, in which large quantities of food can be stowed away. It is from the crop that pigeons obtain the soft milky stuff with which they feed their young. In most birds the succeeding portion of the canal is divided into two (and sometimes three) distinct parts—the glandular and the muscular stomach. In the first (the *proventriculus*) the food begins to be digested, in the second (the *gizzard*) it is subjected to grinding. The former is characterised by thick, soft glandular walls, and near it the blood-gland, known as the spleen, is situated. Most people are familiar with the large hard gizzard of fowl or pigeon, with its very thick muscular walls lined internally by hard secretion. The cavity usually includes small stones, and by the approach of the two sides



Fig. 9.—Alimentary Canal of Pigeon:

a, crop; b, proventriculus; c, gizzard; d, intestine.

The cavity usually includes small stones, and by the approach of the two sides

the food is very effectively ground. The changes dependent upon food, above referred to, are expressed in the varying preponderance of glandular and muscular regions. The exit from the stomach is turned upwards (as in crocodiles), so as to lie very near the entrance. Of the long small intestine and the short large one, of the blind processes given off at the commencement of the latter, of the associated liver (very often without a gall-bladder) and pancreas, there is little of much interest to notice. The gut ends in a common chamber or cloaca, which also receives urinary and genital products. The back wall of this common chamber is connected with a peculiar sac with glandular walls, especially prominent in young animals, but of dubious import.

Vascular System.—The heart of birds shows a marked advance over that of reptiles, in the complete separation of arterial and venous blood. Like that of mammals, it is perfectly four-chambered. The blood-vessel arrangements also resemble those of mammals in the presence of a single main branch (*aortic arch*) conveying pure blood from the heart to the body; but this runs to the right instead of to the left. The most remarkable physiological fact about the blood is its high temperature of 100° to 112° F., greater than that of mammals by 2° to 14°. Birds agree with mammals in being 'warm-blooded' or stenothermal; that is to say, they have an automatic thermotaxic mechanism which enables them to keep the temperature of the body almost quite constant, year in, year out.

Respiratory System.—The two lungs do not lie freely in a closed space, as in mammals, but are fixed to the ribs of the bird. They are non-expandible, and breathing out is the active part of the respiratory process. They are also peculiar in the way the bronchial tubes branch and in being continued into Air-sacs (q.v.). These air-sacs are



Fig. 10.—Lungs of Bird :

a, base of trachea; b, bronchial tubes; c, branches of bronchi; d, blood-vessel.

large but thin-walled bags, nine in number. They are connected on the one hand with the bronchi, on the other, as John Hunter showed, with the air-spaces found in the spongy bones. The air-sacs aid greatly in economising respiration by acting as extra reservoirs, and they assist in regulating the body temperature by acting as organs of internal perspiration. Birds usually require much water, and yet there is little water included in the urine. The surplus water seems to be got rid of by a sort

of internal sweating in the air-sacs. There is no skin-sweating such as mammals show. The wind-pipe or *trachea* is often very long and coiled, and is strengthened by gristly or bony rings. It sometimes comes into very close association with the breastbone, running through part of it in the swan. At its upper end there is, as usual, a larynx; but this is not the vocal organ of birds. Further down, at the point where the windpipe divides into the two bronchial tubes, lies the seat of all the music, the sing-box or *syrinx* (see the paragraph on Song).

The Excretory System.—A pair of three-lobed kidneys embedded under the shelter of the hip-girdle perform the usual function of getting rid of nitrogenous waste. They are connected by a pair of ducts (*ureters*) with the cloaca. There is no urinary bladder. The urinary secretion is semi-solid, and rich in uric acid.

Reproductive System.—The male reproductive organs (or *testes*) are paired, and lie in front of the kidneys. The left is very often larger than the right. They are connected by a pair of ducts (*vasa deferentia*) with the common chamber, the wall of which occasionally bears a copulating organ. The female organs are peculiar in this, that in the adult the left side predominates over the right. In the embryo two ovaries are present; in abnormal and in a few exceptional cases (diurnal birds of prey) they may persist; usually, however, the right wholly degenerates. And similarly with the ducts, but the rudiment of a right oviduct is present. The end of the left oviduct is expanded to receive the ova as they burst from the ovary; the upper part of the duct is glandular, and equips the eggs with albumen; the lower is firmer, and contributes the limy shell; and the end opens into the cloaca whence the eggs are laid.

Nutrition.—The food of birds varies greatly, not only in different birds, but also to some extent at different seasons. Some are vegetarians, feeding on the green parts of plants, and in these the intestine is as usual long. Some confine themselves to grain, and these have large crops and powerful gizzards, while others combine cereals with insects (usually then without crop), or with the green parts of plants. A few sip honey, and a large number feeding on fruits probably play an important part in the dissemination of seeds. In insectivorous and fruit-eating birds the crop is usually absent, and the stomach only slightly muscular. Others again are notoriously carnivorous, or feed upon fish and molluscs, and in these cases the glandular predominates over the muscular portion of the stomach. The kea (Nestor) of New Zealand, originally a fruit-eating bird, has recently developed an alarming fondness for the blood and fat of living sheep. The interest of the nutrition of birds is twofold: on the one hand, in relation to the modifications of the alimentary system; on the other hand, in respect to the rôle of birds in the economy of nature. The experiments of John Hunter on the changes in the stomach of gulls consequent on a change of diet have been corroborated and extended. Such changes appear to occur normally in nature. Food is also said to have an influence on colour—e.g. in bullfinches and parrots.

Locomotion.—Most birds use their wings in flight, the feather-covered arms being raised and depressed with great rapidity by means of the breast muscles already described. Every one who has watched birds is familiar with the marked differences in rapidity and mode of flight. It has been calculated that a common average of rapidity is about 40 to 60 feet per second, but records of the feats of carrier-pigeons, &c. certainly greatly surpass this. It seems probable that strong-winged birds, like eagles, can cover about 80 feet in a second. Buffon noted that they disappeared from sight in about three

minutes. It is safe to say that a rate of a mile per minute is very common. Strong birds, like the albatross and birds of prey, can not only fly very rapidly, but can sustain their exertions for long



Fig. 11.—Wing of Pigeon, showing primary (a) and secondary (b) feathers, and 'bastard wing' (c) at thumb.

periods, while many other birds rarely take prolonged flights, except during migration. The wings of penguins have become flippers, and some other aquatic birds, like the steamer-duck, use them as paddles, auxiliary to the legs. On the ground birds vary greatly in rate and manner of progression; the swift strides of the ostrich, the rapid run of the partridge, the hopping of the sparrow are well-known illustrations of different gaits. That many birds are expert divers and climbers is also a familiar fact. See FLYING.

Respiration.—The great activity of birds is associated with very efficient respiration. Expiration, or the expulsion of used air, is managed by the contraction of breast and abdominal muscles, which compress the inclosed cavities and force the air from the sacs and lungs. When these muscles are relaxed the cavities again elastically expand, and fresh air rushes in by the windpipe to lungs and air-sacs.

Song.—With few exceptions, birds have a vocal organ, and are able to produce more or less variable sounds. The organ is, however, advancing in the running birds, such as the ostrich, and in the American vultures. The sounds produced are almost as varied as the different kinds of birds, and an expert ornithologist has little difficulty in identifying a great number of forms by their distinctive noises. That some chirp and others scream, that chattering describes the language of many and croaking that of others, that some boom and others bark, that the crows caw and the laughing jackass laughs, that the mocking-bird imitates and the parrot becomes able to articulate, and above all that the lark trills and the nightingale truly sings, are well-known illustrations of the variety of bird language. The weird cry of the curlew or whaup, the melancholy voice of the seagull, the gabble of ducks, the crowing of the cock, the soft cooing of the dove, the hoarse voice of the corn-crake, the ecstatic melody of the bobolink, the cheerful notes of the blackbird, the educated music of the canary, are again a random selection of instances from an almost infinite medley. It is among the so-called perchers, songsters, or insesores, that we find song really developed, and that for the most part in the males, and in highest degree at breeding time. Though the notes are not musically pure, many bird songs have been expressed in musical notation, and every one is familiar with imitations in word form.

In mammals the voice is produced by the

mechanism of vocal chords situated in the larynx at the top of the windpipe. In birds these vocal chords are never present, but their absence is compensated by the development of a sing-box (or syrinx) at the base of the windpipe. In some cases the sing-box is wholly produced from the base of the windpipe (or trachea)—e.g. in *Thamnophilus* and American Passerines; in a few cases the mechanism is confined to the beginning of the bronchial tubes (e.g. *Steatornis*); in the great majority of songsters the syrinx includes the base of the trachea and the tops of the two bronchi. The mechanism is a very variable one, and even in its simplest forms not to be understood by any verbal description unaccompanied by dissection of a few typical singers. To take a typical example of a lower larynx or syrinx of the last and commonest construction, we find (a) that the base of the trachea and the tops of the bronchi are altered by lateral compression or by expansion, by fusion of several of the strengthening rings, or by incompleteness of some of the same. (b) The end of the windpipe is divided by a bony ridge, rising up at the angle where the two bronchi unite, and forming the main stay of the resonating cavity known as the 'tympaum.' (c) From this bony ridge to the median surface of each bronchus stretches the 'internal tympanic membrane.' (d) Between the last tracheal and the first bronchial ring, or between a pair of modified bronchial rings, stretches a second 'external tympanic membrane.' (e) In singing-birds there is a third important inward projecting 'semi-lunar membrane.' (f) Besides these there are vocal membranes or folds of skin, projecting inwards in both bronchi. The tension of the membranes is varied by the action of special muscles; their vibration as the air passes over them causes sound; the note varies with their muscular state, with that of the tympaum, and with the column of air in the windpipe.

Singing is an unbidden expression of emotional energy. It is most marked at the high tide of sexual emotion during the breeding-season. It is best, sometimes solely, developed in the males, who use their powers to attract the females, and often vie with one another in so doing. In other cases the note is obviously used as language, expressing alarm and the like, for that some birds are able by voice to convey impressions to one another is indubitable. In so far as the song is an instrument and expression of sexual attraction, it falls to be included among those powers which have been strengthened and developed by sexual selection.

Moulting (q.v.).—After the strain of the reproductive period, or sometimes at the low ebb of mid-winter, the old feathers drop off, and birds undergo annual moult. The use of this in replacing breakage, and in furnishing a complete machinery for the flight of migration, is very evident; the cause is not yet sufficiently investigated. Moulting obviously presents some analogies with skin-casting and hair-shedding in other animals, and must be associated with some deep-seated constitutional change, such as its connection with the end of

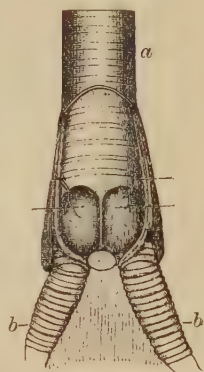


Fig. 12.—Syrinx of Thrush, partly dissected.

a, trachea (opened below);
b, bronchi (with rings).

the breeding-season suggests. Besides this annual growth of new feathers, many birds exhibit double, and some triple moulting. The ptarmigan, for instance, changes its suit three times in the year, moulting after breeding into gray, changing this for white as the winter sets in, and acquiring in spring a third and most attractive set of feathers. In association with sexual attraction many male birds seem to undergo a partial moult, as the result of which they acquire those special decorations which are the index of a reproductive climax.

Reproduction.—Birds usually pair in spring-time, but to this rule there are many exceptions. Fertilisation is internal, and all birds are oviparous. The number of eggs is often in inverse proportion to the size of the bird. Several, such as the apteryx, lay only one; the doves and the birds of prey lay two or three, but the majority of birds many more.

The Sexes.—The male birds are often markedly different from the female. In the Bird of Paradise (q.v.), for instance, the two sexes are at first alike, but with successive moults and increasing maturity, the male becomes in colour and plumage a most marked contrast to the comparatively sober female. The contrast between peacock and peahen is a yet more familiar illustration of a very widely observed fact. In rare cases the female is the more brilliant. The male has also a richer and more varied voice, and in many cases the singing is all on his side. Both with song and with dance, by strains of love and display of charms, by the wildest excitement of aerial evolutions, and by the most grotesque of striking attitudes, the males strive to captivate the females. For the details of this sexual attraction, and for the importance of sexual selection in evolving decorations and charms, the reader may be referred to Darwin's *Descent of Man*, where the subject is very fully discussed. Birds associate together to very different degrees; thus, eagles live separately, the two sexes only coming together at breeding time; the doves live in pairs; many birds are similarly monogamous, but live in society, except during the breeding-season, while fowls and some running birds are polygamous, one male ruling over a number of females. See SEX.

Eggs.—The size of the egg is very generally proportionate to that of the parent, but there are many striking exceptions. The very centre of the egg contains what is known as white yolk which rises as a plug to the surface. This white spot, usually lying uppermost when the egg is opened, is the area (*blastoderm*) where by the multiplication and arrangements of cells the embryo chick is mapped out. The 'yellow yolk' is traversed by concentric

fluid white of egg or albumen, which is separated from the yolk by a (*vitelline*) membrane inclosing the latter. The fluid albumen is also disposed in layers, separated by fibrous networks, and almost every one is familiar with two thick sets of fibres (known as the 'tread') which extend from each end of the yolk into the surrounding albumen. In the lower portion of the oviduct (the *uterus*) the egg becomes, as we have already noted, inclosed in a limy shell. This is an organic structure and is two-layered. Its texture and microscopic characters differ in the various orders, and appear to be truly diagnostic. The shell is separated from the white of egg by a double membrane, the two layers of which become separate at the broader end, and leave a familiar air-space which increases with the age of the egg. The form of the finished egg varies from an approximately perfect sphere to more or less symmetrical ovals. In the uterus the shell usually becomes stained by complex secretions of pigment which in some respects resemble those of the blood and bile. As many as seven distinct pigments have been distinguished by Mr Sorby. It is necessary to distinguish the ground colour from the subsequent more or less circular markings, which become variously blotched and distorted by the movement of the egg in the uterus. The markings are not always constant, but vary with age and even in the same brood. The colouring is apparently to some extent protective against the sun rays, and varies also according to exposure. That the colour of the eggs often favours their being overlooked by enemies is a familiar fact. Though the older naturalists, before the collecting of eggs had been superseded by embryology, doubtless exaggerated the importance of their science of 'oology,' it is also certain that some important hints in classification have been afforded by the study of the characteristic colouring. The extraordinary enthusiasm exhibited by egg-collectors, from the time of Sir Thomas Browne's cabinet onwards, is a most remarkable side chapter in the history of science, which has been recapitulated in the lives of many of our famous naturalists, and indeed in the boyhood of almost every boy bred in the country. See EGG, CAGE-BIRDS, INCUBATION.

Development.—The development of the embryo bird will be discussed along with that of other backboneed animals (see EMBRYOLOGY); but a few general facts (with special reference to the fowl) may be noticed here. The egg is fertilised in the upper part of the oviduct before the coating of albumen is added to the ovum proper. The usual division commences in the lower part of the oviduct, shortly before the shell has begun to be formed. Owing to the vast amount of nutritive, as opposed to formative material, the whole ovum does not divide, but only a special part of it, known as the germinal disc. It is also noteworthy that the division proceeds somewhat unsymmetrically. The subsequent changes by which the different germinal layers are established, and nervous system, backbone, gut, muscles, and the organs generally are formed, cannot be here discussed. The development of the chick excited interest even among the old naturalist philosophers of Greece, and we have not finished the inquiry to-day. It was by observation of the embryo chick that Wolff first showed distinctly (in 1759) that development was a matter of gradual growth, and not the unfolding of a miniature ready-made organism. It was in regard to the fowl that Pander (1817) first drew emphatic attention to the different germinal layers, the distinctions between which are of such importance in understanding the process of development. On the development of the chick also, Von Baer (1828-37) partly based his great generalisation as to progress

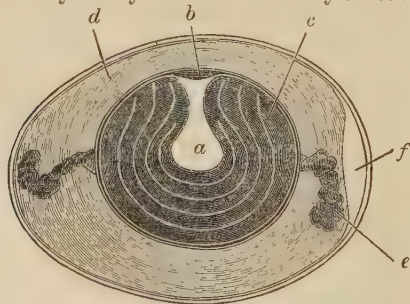


Fig. 13.—Section of Fowl's Egg:

a, central plug of white yolk; b, position of germinal area; c, yellow yolk; d, white of egg; e, 'tread' or chalaza; f, air-space between outer membranes.

layers of white, which also forms a thin layer round the outside. As the egg passes down the upper portion of the oviduct it becomes coated with

from the simple to the complex, and showed that the passage of the embryo from one great stage to another corresponds to the successive steps which mark off fish from amphibian, amphibian from reptile, reptile from bird. This law we now express by saying that the individual development (*ontogeny*) is a recapitulation of the historic evolution of the race (*phylogeny*). Mr Parker eloquently compares watching the development of a bird to reading a palimpsest; under the more superficial characters are others (at an earlier stage) more primitive, beneath those others more primitive still, till the characters are seen to be distinctly reptilian, and so on backwards. The work thus begun by Wolff, Pander, and Von Baer has been vigorously continued; many of the greatest embryologists have contributed to the elucidation of bird development; in Britain Parker especially has, with marvellous patience and skill, followed the development of the bird skull. By the recent use of the contrivance known as the embryo-scope, the development of the chick has been watched going on, and even experimented upon.

The chick is inclosed in an embryonic membrane known as the amnion, and has a large respiratory sac called the allantois. The nutritive yolk which is gradually absorbed is inclosed in a 'yolk sac.' When about to be hatched, the chick thrusts its beak through the egg-membranes, and breathes the air in the air-chamber. The lungs begin to work, and the allantois shrivels up. The Umbilicus (q.v.) becomes completely closed, and 'the chick, piercing the shell at the broad end with repeated blows of its beak, casts off the dried remnants of allantois, amnion, and serous membrane, and steps out into the world.'

The period of incubation, during which the parent, generally the female, but often also the male, sits in most cases constantly on the eggs, varies greatly, from ten days to eight weeks. The young birds may be at first naked, blind, and helpless, and are then fed by the parents till fledged (Altrices or Insesores)—e.g. Thrush, or they may be downy, active, and able at once to look after themselves (Præcoces or Autophagæ)—e.g. Chick. In some cases, however, they are hatched downy, but remain for a while helpless. See EMBRYOLOGY.

Nests.—It is important to notice that the higher development of birds, as compared with reptiles, is associated with the production of fewer offspring, but at the same time with the enormous increase of parental care and sacrifice. If the young are to be developed within the eggs, the latter must be kept at an approximately constant warmth. In almost all cases this is effected by brooding. The comfort of the parents during the hatching period is secured by the nest, which becomes further necessary for the protection of the fledglings. The nest-building instinct is not indeed the exclusive property of birds, but occurs also among insects and fishes, not to mention the numerous cases where homes rather than nurseries are constructed by animals. But it is among birds that the instinct reaches perfect development. The prolonged period of brooding, the frequent helplessness of the young, the very common arboreal habit, the not unfrequent enemies, have necessitated a most varied series of nest-building contrivances. The nest is built before the eggs are ready to be laid, and in most cases the female takes the prominent part in its construction. But both in the building and in the subsequent brooding the male may do his share, or in some cases much more. Each species usually has its own peculiar style and material of construction, though this may be adapted to varying conditions. The nests are usually solitary, more rarely grouped, and very exceptionally (as among cassowaries and ostriches)

common property. Rooks, sea-fowl, herons, are familiar examples of breeding communities, while the sociable grosbeak, the republican swallows, and a few others, form even closer associations. The cuckoo and the cow-bird have managed by a sort of parasitism to shirk their task, and quite a number of birds lay their eggs in an exceptional manner in the nests of neighbours. The beak is the organ most used in construction, but the pressure of the body may round off the forming nest, and the feet may also be used. How comfortable a nest may be made inside every one knows; how adroitly hidden it may be by external decorations of moss and lichen is familiar to every nest-hunter. All who have opportunity should examine the cases of birds and their nests so beautifully arranged in the British (Natural History) Museum in London. The smaller birds usually build the more beautiful nests, and every variety occurs, from the comparatively careless hole in the sand made by the ostrich to the skillfully suspended and neatly fashioned nest of the tailor-bird.

Without entering into details of nest-construction, the following series given by Leunis may be noted. For details, such a work as Rev. J. G. Wood's *Homes without Hands*, and for theory, Wallace's essay on Nests in his *Contributions to the Theory of Natural Selection*, may be profitably consulted. It must at the outset be again noticed that habits vary considerably, as the very diverse nests built in different circumstances by falcon, eagle, heron, &c. well illustrate. Nests are shifted to suit food-supply, and vary in structure according to the available material. And again, since nest-building is obviously an acquired habit, which gradually rewarded the species in the greater success of both parent and offspring during breeding time, it is natural to find it dispensed with in many cases where the nature of the situation rendered no actual nest necessary, or where the birds for some other reason have never learned the habit. Some sea-birds, like the auk, simply lay on the rocky ledges of their haunts; some ground-birds simply deposit their eggs on the bare soil.

(1) *Burrowed holes* are made by sand-martins, bee-eaters, penguins, kingfishers, and many others. The prairie-owl, living in the burrows of the prairie-dog and of the armadillo, is a well-known example of peculiar habit, and in the first case of curious partnership. (2) *Ground-nests*, generally of the simplest character, with rough and scanty accumulation of nest material, are made by swans, ducks, geese, fowls, gulls, waterhens, corncrakes, &c. (3) *Mud-nests*, constructed from damp earth, are well illustrated by the house-swallows, blue-creeper, flamingo, &c. The common singing thrush is well known to make a firm nest of clay and cow-dung mixed with moss. (4) *Carpenter-nests*, formed with more or less preparation in the holes of trees, are used by woodpeckers and a few other arboreal birds. (5) *Platform-nests*, simply consisting of flat seats, are formed by the ring and turtle doves, by eagles, storks, and cranes. In some parts of the Continent the flat nests formed by the storks on the tops of buildings are familiar enough objects. (6) *Basket-nests* are such loosely interwoven constructions of grass, stems, twigs, &c., as are made by crows, missel-thrushes, and most singing-birds. The green weaving-birds (*Ploceus pensilis*) hang their loosely woven nests, with downward directed opening, on the Madagascar trees. The South African republican birds (*Philetarus socius*) form hundreds of hanging nests on the branches, under the shelter of a common thatch. (7) *Woven nests* are the more delicately constructed and really woven constructions of wool, hair, bark, grass, &c., which are made by

such birds as the goldfinch, the Baltimore bird, and very many others. (8) *Sewed nests*, composed of leaves sewed together by the beak as needle, are well illustrated by various species of Icterus, and by the Indian tailor-bird (*Orthotomus bennetii*). (9) *Felt-work nests* are woven from the wool of plants or animals, sometimes with other material in addition; the humming-birds and the bullfinch form beautiful nests of this fashion. (10) *Cement-nests* are bound together by a viscid and very adhesive secretion, which is mixed with saliva, and used to glue the materials of the nest together. The nests of the American swallow, the edible birds' nests of the Salangani, sought after as luxuries by Chinese and others, are of this cemented type. (11) *Dome or moss nests* are roofed in above, and have an entrance on the side. The common wren, the water-wagtail, and the tits build on this principle. The beautiful bottle-shaped nest of the titmouse is one of the best examples. (12) The *parasitic* habit is well known among cuckoos and cow-birds. The nest of another bird is utilised to the future loss of the rightful inmates, and with obvious economy of labour on the part of the intruders. Thus sparrows usurp the nests of swallows, and starlings those of woodpeckers. Pheasant and partridge eggs are sometimes found in the same nest, and the same has been observed in many cases—e.g. gull and eider-duck. When artificial nests are forthcoming, birds are glad to be relieved of the labour of construction, and different birds thus sometimes share a common box. The resorts of birds, when convenient nooks are available, are often extremely curious.

Migration.—It is a well-known fact that comparatively few birds (at anyrate, outside of the tropics) remain in the same place all the year round. They do not hibernate, but migrate on the approach of cold. Some we know as winter visitors returning north again in spring, most we know only in summer, for in autumn they fly to the warmer south; a third set we call 'Birds of Passage,' for these we only know somewhat incidentally as they pass through on their way elsewhere. Thus the swallow, the cuckoo, the nightingale, &c. come to Britain in summer and breed there, being winter residents farther south; the fieldfare, jack-snipe, bean-goose, redwing, &c. reach Britain in winter, being summer residents and breeders farther north; while the little sandpipers are familiar examples of the true birds of passage which we know only for a short time as they rest on our shores in their journey south in autumn, and north again in spring. These three classes are obviously only different cases of one fact of Migration (q.v.). As this will be discussed separately, only the general facts are here to be noticed. Almost all birds are in some degree migratory. Those which breed in the equatorial regions are the chief exceptions, and even they pass from hill to valley and back again. Forms, too, which seem to be constant residents of a non-tropical country are in many cases known to exhibit a partial or a very local migration. This is true, for instance, of the common wren and the red grouse in the north of Scotland. All birds breed in the colder regions of their migration. Changes in food-supply and temperature are the most important conditions impelling them to shift their habitats. The general trend of migration is always, as indicated, towards the equator in autumn, from the equator in spring; but the investigations of the British Migration Committee have clearly shown that the courses are generally great curves. The flight is the more universal in a country the more marked the contrast between summer and winter. The annual migration from breeding areas too cold for winter

residence and food-supply to warmer subsistence areas cannot be understood apart from the history of climates. When the European climate was more equable, it was virtually indifferent to the birds where they went. As it grew colder, the birds had to fly farther and farther south every few winters. Migration has become an inherited habit, for they set about it before the impelling conditions are directly present. According to Wallace, natural selection has played an important part in confirming this habit. Many facts about migration are still utterly obscure. The power birds have of flying straight and of returning to the same locality is very marvellous. It must be remembered that a continuous tradition is sustained; those who have made the journey before guide the others. Doubtless they have memory for great landmarks. They fly across the shallower parts of the Mediterranean, where a chain of islands in this submerged tract long remained to guide them. The smaller birds usually keep nearer the ground; but it must not be forgotten that the flight is usually mostly accomplished by night. Birds generally meet in concourses, and migrate in flocks. Only a few fly alone. Sometimes the old males remain, while the others 'fit.' The return northwards is more rapid, without young ones or weaklings. The males often return first.

Intelligence and Emotions.—As birds have a full active life, with considerable variety of function, in usually complex environment, since, as we have already noticed, their sense-organs and nervous systems are highly developed, considerable exhibition of intelligence is to be expected. They seem to have great vividness of sense impressions, to judge from their power of recalling old haunts and old friends. Birds often return to the same place season after season, and they have been known to recognise an owner after the lapse of years. Their quickness of ear and power of retention are evidenced by the power some possess of learning to repeat sounds, both words and tunes. Some have exhibited marked fondness for music, and the æsthetic tastes of the Bower-bird (q.v.) excite deserved admiration. Much more is known in regard to their marvellous hereditary, general, and largely automatic reasonable habits or 'instincts,' than in regard to their power of individually adapting their conduct to novel circumstances. Their beautiful and adroit contrivances of nest-building are very familiar instances of the former, but many instances of the latter have also been recorded. Mr Romanes has collected numerous illustrations of curiosity, imagination, forethought, and instruction by experience. He notes many interesting cases of their special devices in obtaining food, in avoiding capture, and in nest-building. His valuable treasury of sifted facts ought to be consulted on this subject.

As to feelings, it is hardly necessary to refer to their unexampled exhibition of sexual emotion in song and dance, parade and display, or to the marvellous parental love and sacrifice expressed in their nest-building labours, in their prolonged incubation, and in their care for and courage in defending their brood. Subtler emotions of jealousy, both in connection with and altogether apart from sex, of affection for owners or associates, of sympathy for wounded or enfeebled fellows, are also not rarely exhibited. That a bird singing continuously for hours does not represent a rare height of emotion is not to be believed. It may be fairly said that the joyous song of the lark 'at heaven's gate' is an eloquent expression of emotion only surpassed perhaps by human music.

Distribution in Space.—It is a curious fact that though birds are able to fly far and wide, and are

much less settled than most animals, it was in relation to them that the first great essay towards an understanding of distribution was made. In 1857 Mr Slater based, upon the facts of the distribution of perching birds (Passeres or Insectores), a division of the earth into six great regions, with characteristic fauna. These regions he termed Palaearctic, Ethiopian, Indian, Australian, Nearctic, and Neotropical. For an account of the birds which especially predominate over these great regions, or others with somewhat altered limits, the reader must be referred to the works of Murray and Wallace on Geographical Distribution of Animals, and to the convenient summary of facts given by Heilprin (Inter. Science Series). Some genera of birds are very widely distributed, and almost universally represented; others, like the birds of paradise and the humming-birds, are peculiarly restricted. It hardly needs to be stated that birds have unusually great facility of dispersion; that they are more numerous in the warmer countries; that according to the nature of the region, different physiological types will preponderate—e.g. insect-eating birds in the tropics, and fish-eating swimmers in the northern seas.

Distribution in Time.—(1) In the Triassic strata of New England, various kinds of footprints occur which most naturalists now regard as reptilian, though others are inclined to see in some of them the earliest hints of birds. (2) The oldest known birds are found in the Upper Oolite, the well-known *Archæopteryx* (q.v.), from the Solenhofen lithographic slates, and *Laopteryx priscus*, from 'a nearly equivalent horizon in the Wyoming Territory' of the western United States. The long feathered tail, the unfused metacarpal bones, the toothed jaws, and other features of *Archæopteryx*, are exceedingly important pristine characters. (3) In the Middle and Upper Chalk, numerous fossil birds have been discovered, especially by Marsh. These are grouped together in a somewhat mixed division of toothed birds, or *Odontornithes* (q.v.). Of these the most remarkable are *Hesperornis* and *Ichthyornis* (q.v.), both with teeth. The latter had biconcave fish-like vertebræ, well-developed wings, and a keeled breastbone. The former had vertebræ much like those of modern birds, rudimentary wings, and, as one would expect, no keel on its breastbone. Its teeth were not implanted in distinct sockets as in *Ichthyornis*, but lay in a longitudinal groove of the jaw. *Apatornis* was another remarkable form, and *Enaliornis* has been found in Europe in the Upper Greensand of Cambridge. (4) In the Tertiary deposits birds become more numerous, and like those now existing. Representatives of modern genera occur from the Eocene onwards. Many types, such as the great running birds, now with restricted distribution, are found in regions far from their present habitats. A giant goose-like form, *Gastornis*, apparently exceeding the ostrich in size, has been found in France and Britain. Heilprin notes how *Leptosomus*, type of a small family now restricted to Madagascar, is found in the Eocene deposits of France. In the Eocene also occur *Megalornis*, little smaller than an emu; *Dasornis*, uniting ostrich and moa; *Odontopteryx toliapicus*, 'with dental armature recalling the toothed birds' of the chalk. A crane-like genus, *Aletornis*, is frequently represented in American strata. Giant forms disappear, the running birds are driven into corners, teeth degenerate and wings develop, as the modern bird fauna is gradually approached. Those who wish to read the full story should consult especially the writings of Marsh, and in the first place convenient summaries, such as that of Heilprin.

Sub-fossil and Historically Exterminated Birds.
—Within comparatively recent (semi-historic)

times, the 'moas' of New Zealand (*Dinornis* and *Mionornis*), the *Epyornis maximus* of Madagascar, the Australian *Dromæornis* (ancestor of the emu), and others have disappeared. Much more recently the dodo of Mauritius, the solitaire of Rodriguez, the crested parrot and the *Aphanapteryx* of Mauritius have been exterminated. Under separate articles some of these will be discussed. Thoughtlessness and cruelty are unfortunately tending to the extermination of some other forms.

Classification.—In 1880 Mr Slater estimated the number of extant bird species at 10,139, and Gray's estimate was somewhat higher. To these some 200 known fossils have to be added. The classification of these numerous forms is still a matter of the greatest difficulty. The older classifications were based on the habits, or on comparatively trivial characters; but as this physiological classification has been gradually improved, it has come to be not so inconsistent as formerly, with the anatomical classification suggested by Huxley. In his famous paper on the 'Classification of Birds,' *Proceedings of the Zoological Society*, 1867, Huxley grouped birds according to certain features of the skull, and though this may seem too narrow a basis, it must not be forgotten, as W. K. Parker remarks, 'that the structures of the skull and face govern the whole body, as it were; every other part of the organism corresponds to what is observable there.' But even when the great groups are marked off on this basis, there remains the huge difficulty of the genera and species. The difficulty of satisfactory diagnosis is due to the narrow range of modification. 'One bird is so like another,' say the non-ornithologists, and Professor Huxley confesses the same in saying that 'the structural modifications which the specific forms present are of comparatively little importance; any two birds which can be selected differing from another far less than do the extreme types of the lizards.'

While there is general agreement in distinguishing three great divisions of (1) ancient birds, like *Archæopteryx* (*Saururæ*); (2) running keelless birds, like ostrich (*Ratitæ*); and (3) keeled flying birds (*Carinatæ*), the divergence of classification observed in grouping the last of these three divisions is very great. In many works, especially text-books, the old orders of swimmers (*Natatores*), waders (*Grallatores*), scratchers (*Rasores*), climbers (*Scansores*), perchers (*Passeres* or *Insectores*), and birds of prey (*Raptores*), are still followed. In other cases some of these are retained, and others split up or rearranged in smaller orders, and a dozen or more established in all. It seems therefore most useful simply to append the classification of Huxley, with examples showing their relation to more familiar divisions.

- I. *Saururæ*.—Metacarpals not fused. Tail longer than body. Often with teeth—e.g. *Archæopteryx*.
- II. *Ratitæ*.—None of preceding characters. Flat unkeeled breastbone—e.g. (1) the kiwi (*apteryx*), with a big toe; (2) the 'moas,' cassowaries, and emus without a hallux; (3) the ostriches, differing from the preceding in having a long upper arm (humerus), and two (not one) clawed digits—the American ostriches or *Rheas*, with ischia (see hip-girdle) united, but pubes free, and the true ostriches or *Struthios*, with the ischia free, but the pubes united.
- III. *Carinatæ*.—Ordinary birds with keeled breastbone.
 1. (a) *Dromæognathæ*.—Vomer broad behind, interposed between pterygoids, palatines, and basisphenoid rostrum—the *Thimamus*.
 - (b) (2-4) Vomer narrow behind, pterygoids and palatines articulating largely with basisphenoid rostrum.
 2. *Schizognathæ*.—Maxillo-palatines free, vomer truncated in front. Plovers, gulls, penguins, cranes, fowls, sandgrouse, pigeons, hoazins, goatsuckers, humming-birds.
 3. *Ægithognathæ*.—Maxillo-palatines free, vomer truncated in front. Part of *Geranomorphæ*, the Hemipods, swifts, Passerine birds.
 4. *Saurogathæ*.—Vomerine halves permanently distinct, maxillo-palatines arrested (except in woodpeckers, united more or less completely). Woodpeckers, birds of prey, parrots, cuckoos, kingfishers, trogons, goose-like birds, flamingos, storks, cormorants.

While the meaning of the terms can only be appreciated with the skull in hand, the above classification is independently of value as showing what orders of birds are on anatomical grounds most nearly related.

Pedigree.—It is generally allowed that birds have risen out of reptiledom. Such an origin is suggested not only by the general fact that 'reptiles' in the wide sense form the nearest distinctly lower class, but by resemblances of structure revealed in anatomical research, and still more by the study of bird embryology. But the crowning evidence in favour of this origin is found in the primitive characters of the first known bird (*Archæopteryx*, q.v.), and by the series of forms connecting flying saurians and toothed birds. Birds are derived from the ancient reptiles or saurians known as *Deinosaurs* or *Ornithoscelida*. These lead up to the primitive birds or *Saururæ*, from which two branches diverge, represented by the keelless birds (*Ratitæ*) on the one hand, and by the keeled birds (*Carinatae*) on the other. To discuss the nature of the step by which birds took wings and rose out of reptiledom, is to raise the whole problem of organic progress. To refer the step, as Buffon did, simply to a change in the quantity of carbonic acid gas in the atmosphere, is to give the process a false simplicity. To assume the accumulation of reptilian variations by natural selection in the struggle for existence, is the consistent Darwinian view. It is probably more correct to regard the incipient birds as, so to speak, 'fevered representatives of reptiles progressing in the direction of greater and greater constitutional activity.' Flight would be at first spasmodic, but as the structures became modified by function, would gradually become more constant and less pathological. The high temperature, the feathered skin, the flight, the hollow bones, the long rest of brooding, are probably all expressions of one predominant constitutional tendency. It must also be noted that the sacrifice of parental care justifies itself in the success of the brood. See *EVOLUTION*.

Economic Importance.—In their connection with other parts of the web-like world of life, as well as for their own sakes, birds are of much practical importance. Though eagles are sometimes destructive of lambs, the birds of prey more than make up for this by keeping down the vermin; though many birds rob fruit-trees, devour seeds, and pillage growing crops, their services in keeping away plagues of insects more than counterbalance the damage they do. That some (e.g. humming-birds) visit flowers and act probably as pollen-carriers, and that others aid in the dispersion of seeds, are minor offices. That the flesh and eggs of many, both wild and more or less domesticated, are common articles of food; that the down and feathers of some are in common use for comfort and decoration; that the excrement of others forms the useful manure known as guano, are facts familiar to all. In exceptional cases, birds may be of more curious utility, a variety of pigeon discharges the functions of a letter-carrier, falcons used to be much employed in sport, the nests of one form are eaten, and some birds are kept for amusement and decoration. And when we think of their beauty and song, we must allow that human life would be poorer without them.

Conclusion.—In many centuries, and now more than ever, birds have been studied by the naturalist. The perfection of their structure, the variety and ingenuity of their habits, and in later days the fact of their lofty ascent from lowly parentage, have afforded material for thousands of researches which, in a pre-eminent degree, have been labours of love. In the eyes of simpler men, unacquainted with the technicalities of science, the majority of

birds have for long seemed the most delightful of animals. Apart from their importance as beneficial or hurtful, apart from matters of food and sport, and apart from their ancient augural significance, birds have been universally allowed to possess peculiar charms. Their ethereal habit, their general vivacity, their grace of structure, the beauty of their plumage, the music of their song, the range of their intelligence and emotions, the mystery of their migrations, and other features, combine to make birds the first and last favourites of man. To the artist too they have supplied a wealth of colour, a variety and gracefulness of form, a suggestive beauty of pose and attitude which are not elsewhere equalled. Nor is it necessary to say that just as some of the greatest ornithologists have been at the same time poets, so most poets have been also ornithologists, or at least bird-lovers. To poets of every age and country birds have been 'symbols and suggestions,' although to too many they have been nothing more. They are emphatically the poet's animals; still he is often ignorant of their habits, according to Phil Robinson's indictment in *The Poets' Birds* (1883).

Literature.—Of the immense literature on birds, the following may be noted:

E. Alix, *Appareil Locomoteur des Oiseaux* (for mechanism of flight); Balfour's *Embryology*, vol. ii. (for development); Brehm's *Bird Life*, &c. and *Book of Birds*; Brewer, *North American Oology* (for eggs); the *British Museum Catalogue of Birds*; Bronn's *Thierreich*; Cassell's *Book of Birds and Natural History* (Martin Duncan); Darwin, *Descent of Man*, &c. (for sexual selection); Foster and Balfour, *Elements of Embryology* (for development); Gould's *Birds of Australia* (for reference); Gray and Mitchell, *Genera of Birds* (for reference); Hewitson, *Eggs of British Birds*; Huxley, *Anatomy of Vertebrate Animals* (for structure and classification); Ibis: *Journal of Ornithology*; Jerdon's *Birds of India* (for reference); Leunis, *Synopsis des Thierreichs* (for genera); Macgillivray's *British Birds* (for anatomy and genera); A. Newton and W. K. Parker in *Ency. Brit.*; Owen, *Anatomy of Vertebrates* (for structure); J. G. Romanes and Lloyd Morgan on animal intelligence; H. Seebohm, *A History of British Birds*; Russel Wallace's works (geographical distribution of animals); J. G. Wood, *Homes without Hands* (for nests and general life); Yarrell's *British Birds*; Dresser and Sharpe, *Birds of Europe*; Beddard, *The Structure and Classification of Birds*; Beebe, *The Bird, its Form and Function* (1907); W. Rothschild, *Extinct Birds* (1907).

Bird, EDWARD, an English genre painter of considerable celebrity, was born at Wolverhampton in 1772. On the expiration of his apprenticeship to a maker of tea-trays in Birmingham, where his duty was to ornament the trays with flowers and shepherds, he established himself as a drawing-master in Bristol. In 1809 he sent to the Royal Academy a picture called 'Good News,' which brought him into notice; and two of his pictures, the 'Choristers Rehearsing' and 'The Will,' having procured him influential patrons, henceforth his reputation was secure, and ere long he was elected a Royal Academician. Other pictures were the 'Field of Chevy Chase the day after the Battle,' his masterpiece; the 'Death of Eli,' a number of rather poor Scripture subjects; and the unfinished 'Embarkation of Louis XVIII. for France.' He died in 1819. His reputation now depends on such of his works as 'The Blacksmith's Shop,' 'The Country Auction,' 'The Village Politicians,' and 'The Young Recruit.'

Bird, ISABELLA (Mrs Bishop), an adventurous lady traveller, long resident in Edinburgh, visited Canada and the United States in 1854. During a six months' residence in the Sandwich Islands, from time to time she sent home glowing letters describing what she saw and did, to a sister in Edinburgh. From such materials most of her

books of travel have been compiled. Her lively and picturesque narratives of journeys made to the Rocky Mountains, to the aborigines of Yezo, to Persia and Kurdistan, to Tibet and other parts of Asia, have been very extensively read. Born in 1832, the daughter of the rector of Tattenhall in Cheshire, she married Dr Bishop of Edinburgh in 1881 (who died in 1886); and till within a year of her death in 1904, she continued her travels, her lectures, and her work at home and abroad on behalf of philanthropic and missionary objects. She was the first woman elected F.R.G.S. Among her books are *The Englishwoman in America* (1858); *Six Months among the Palm Groves of the Sandwich Islands* (1875); *A Lady's Life in the Rocky Mountains* (1879); *Unbeaten Tracks in Japan* (1880); *The Golden Chersonese* (1883); *Persia and Kurdistan* (1891); *Among the Tibetans* (1894); *Korea and her Neighbours* (1905); *The Yangtse Valley* (1899). See Life by Miss Stoddart (1906).

†**Bird**, ROBERT MONTGOMERY (1805-54), practised for a year as a physician, but, turning to literature, wrote three tragedies, *The Gladiator*, *Oraloosa*, and *The Broker of Bogota*; and a series of novels, comprising *Calvar* (1834) and *The Infidel* (both dealing with the Spanish conquest of America), *The Hawks of Hawk Hollow*, *Sheppard Lea*, *Nick of the Woods* (1837, a tale of Kentucky during the Revolutionary War), *Peter Pilgrim* (short stories), and *Robin Day* (1839).

Bird, WILLIAM. See BYRD.

Bird-catching Spider, a name originally given to a large spider, *Mygale avicularia*, a native of Brazil, Cayenne, and Surinam; but now more extensively applied to a number of large species of *Mygale*, *Epeira*, and perhaps other genera. The body of *M. avicularia* is nearly 2 inches long, very hairy, and almost black. When the feet are stretched out the animal occupies a surface towards a foot in diameter. The hooks of its mandibles are strong, conical, and very black. This giant spider lives in clefts of trees or in hollows between stones, where it spins a muslin-like tubular nest. During the day the *Mygale*

believes of their having power to expel the tooth-ache.

Mygale or *Avicularia* belongs to that section of spiders in which there are four breathing organs instead of the usual two. The members of this tribe do not form a proper web, but live in holes in the manner above described, and gain their livelihood by hunting. But even the quieter web-spinning spiders (e.g. *Epeiridæ*) seem to manage occasionally to capture birds. Their toils are occasionally many feet long, and sufficiently strong to impede travellers in the forest, so that it is little wonder that humming-birds, and even larger forms, are sometimes entangled. See SPIDER.

Bird-cherry (*Prunus Padus*) is a small tree growing wild in the moist woods in Britain and through the palæarctic region. It is easily recognised by its abundant racemes of small white flowers and deciduous leaves. The drupes are small, unpalatable save to birds (whence the popular name) and schoolboys, but are sometimes used to colour wine and brandy, and are said to be eaten in Siberia. In Scotland the common name is *Hagberry*. A larger but closely allied species (*P. virginiana*), of which the fruit is used to flavour pemmican, has been introduced into Britain. The wood of both species is esteemed by cabinet-makers.

Bird-lice, a popular name for a family of insects (Mallophaga), often placed beside other lice in the order Hemiptera. These external parasites are louse-like in form, usually with a distinctly separated front ring in the breast region (prothorax), with 3-5 jointed antennæ, with biting mouth organs, and more or less of a sucking mouth. They live on the skin of birds and mammals, and eat young feathers and hairs, and also blood. *Trichodectes canis*, *Philopterus versicolor*, *Liotheum anseris*, *Menopon pallidum*, are common species. See LOUSE.

Birdlime is a viscid and adhesive substance, which is placed on twigs of trees or wire-netting, for the purpose of catching the birds which may alight thereon. A common practice is to place a decoy or tame bird in a cage near where the birdlime is spread; the wild birds, attracted to the spot by the song of the tame bird, get entangled with the birdlime. It is also extensively used for catching mice, and even rats, in houses, where poison is objectionable. The birdlime is spread on a board, some toasted cheese placed in the centre, and the trap laid on the floor. The mice in endeavouring to reach the cheese, are held fast by the feet, and may be destroyed. The substance was formerly prepared from the middle bark of the holly, mistletoe, or distaff-thistle, by chopping up the bark, treating it with water, boiling for several hours, straining, and lastly exposing it to fermentation for several weeks, when a gelatinous mucilage is obtained, consisting mainly of a substance to which the name *viscin* has been applied. A second mode of preparing birdlime is to employ ordinary wheat-flour; place it in a piece of cotton cloth; tie up the ends, so as to form a bag; immerse the whole in a basin of water, or allow a stream of water to flow upon it; and repeatedly squeeze the bag and its contents. The result is, that the starch of the wheat-flour is pressed out of the cloth bag, and the adhesive *gluten* is left on the cloth. Other kinds of birdlime are made from viscous substances derived from various sources; for example, a peculiarly adhesive kind is got from a house-leek or *Sempervivum* found in Madeira and the Canary Islands.

Bird of Paradise, the common name of a family of birds (*Paradisidæ*), found chiefly in New



Bird-catching Spider (from Bates).

lurks in the wide porch of its house, but issues forth at night to hunt for its prey, which, according to Bates and others, really includes small birds. They are large enough to be led about by children as playthings. It is probably a species of this genus that Dampier mentions as found in Campeachy, the fangs of which, 'black as jet, smooth as glass, and at their small end as sharp as a thorn,' are said by him to be worn by some persons in their tobacco-pouches to pick their pipes with; and to be by others used as toothpicks, in the

Guinea and neighbouring islands, and remarkable for splendour of plumage. In all other respects, however, they are very closely allied to the crow family, *Corvidæ* (q.v.), to which they exhibit a great similarity, not only in the characters of the bill, feet, &c., and in general form, but also in their habits, and even in their voice. They have been the subject of many fables. The state in which their skins are usually exported from their native islands, gave rise to the notion that they were destitute of feet; and free scope being allowed to fancy, it became the prevalent belief that they spent their whole lives floating in the air, except when perhaps they suspended themselves for a little by their long tail-filaments from the uppermost branches of trees. They were supposed to feed on dew and vapour, or more substantially on the nectar of flowers. Some of them do, indeed, feed partly on the latter. Antony Pigafetta, who accompanied Magellan in his voyage round the world, described them as having legs, and stated that these were cut off as useless in the preparation of the skins; but his statement was not credited, and Aldrovandus went the length of accusing him of an audacious falsehood. Most of the characters ascribed to birds of paradise are simply to be regarded as imaginative revelling in the absence of facts; but it is also possible that some of the fables are in part due to the desire of the inhabitants of those islands in which they are found to increase the value of their skins as an article of merchandise. A sort of sacred character being attached to them, they were employed not merely for ornament, but as a charm to secure the life of the wearer against the dangers of battle. A. R. Wallace also pointed out that the Malayan traders, from whom the birds were usually bought, never saw them alive, knowing them indeed by the name *Burong mati*, or 'dead birds.' The people of Ternate call them *Manuk devata*, or 'birds of God;' which name Buffon modified into *Manucode*. In different languages they are known by names signifying birds of the air, birds of the sun, &c. In 1760 Linnaeus described the largest species, *Paradisea apoda*, and also referred to the King Bird of Paradise. The list was gradually increased, but our real knowledge of the group dates from Wallace's visit to New Guinea in 1857-58. Since then the quest has been followed up with enthusiasm.

The *Paradiseidæ* are comparatively small birds, but their spreading feathers are often of great length. Though allied to crows and starlings, the adult males are in beauty unsurpassed even by humming-birds. Tufts of bright feathers spring from beneath the wings, from the tail, or from the head, back, or shoulders. Trains, fans, and exquisitely delicate tress-like decorations occur abundantly, and the gracefulness of the plumage is enhanced by the brilliant colour and metallic lustre. The females are plain, sober-coloured birds, and it is only with maturity, and after successive moults, that the males acquire that brilliancy of plumage which they exhibit to such advantage in their courtships. The true birds of paradise feed on fruits and insects, and are practically omnivorous. Their mode of life is more or less gregarious. They are intensely active, flitting about the whole day long. There is still lack of information in regard to nests and eggs. Some of them may be readily kept in confinement.

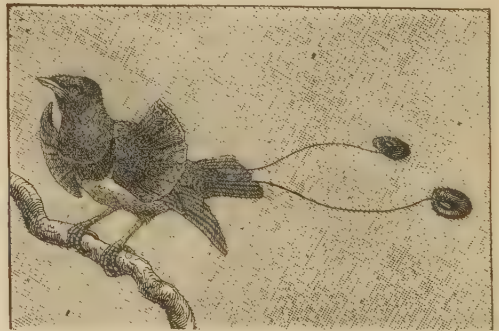
The birds of paradise are usually grouped in two divisions—the *Paradiseidæ* proper and the long-beaked *Epimachidæ*—but Wallace unites these in one family. The former appear more nearly related to the crows, the latter to the hoopoes. Among the *Paradiseidæ* proper, the following species deserve special record. The Great Bird of Paradise

(*Paradisea apoda*) is the largest species, measuring about a foot and a half in length. From beneath



The Great Bird of Paradise (*Paradisea apoda*).

the wings of the male there springs on each side a rich tuft of long plumes, sometimes 2 feet in length. The gorgeous colours, from golden orange to blackish violet, baffle brief description. 'The loud, shrill note is the most prominent and characteristic animal sound in the Aru Islands.' The natives shoot the males with blunt arrows when they are displaying themselves in courtship. So preoccupied are they that many may be shot before the thronging rivals take alarm.—The Lesser Bird of Paradise (*P. papuana*) is smaller and predominantly yellow, except on the breast, which is purplish. The females are white below, and so are the young males. They gradually become more brown and more handsome. This species is very frequently used for ladies' head-dresses. Its home is in New Guinea and adjacent islands. Wallace brought two live specimens to Britain, and they lived for one and two years in the Zoological Gardens in London.—Among closely related species is the Red Bird of Paradise (*P. rubra*), restricted to the island of Waigiou, near New Guinea. It is about 14 inches long, and the side plumes are rich crimson. The two middle tail-feathers form stiff black ribands, about 22 inches long. Wallace notes this bird as one of the most vivid instances of the development of colour and plumage through the selective action of the females. The natives catch them by an



King Bird of Paradise (*Paradisea regia*).

ingenious snaring contrivance.—The King Bird of Paradise (*Paradisea regia*), also called *Cicinnurus*

regius) is much smaller, only about 6 inches long, but is even more brilliant in plumage. The two middle feathers of this living gem are wire-like shafts, about 6 inches long, bearing at their extremities a spiral emerald disc. The females and young males are, as usual, very plain.—The Magnificent Bird of Paradise (*Diphyllodes speciosa*) has a curious double mantle on its back.—The Superb Bird of Paradise (*Lophorina atra*) is yet rarer and more brilliant, and bears a most extraordinary shield (like another pair of outspread wings) on the back of its neck.—The Six-shafted Bird of Paradise (*Parotia sexpennis*) is adorned in many ways, but especially by six slender feathers springing from the back of the head and ending in oval webs. Wallace discovered a beautiful bird, which he called the Standard-wing (*Semioptera wallacei*), especially distinguished by a pair of long narrow white feathers, which spring from the bend of the wing, and are capable of being erected at pleasure.

Among the Epimachidæ, or Long-billed Birds of Paradise, one of the most remarkable is the Twelve-wired Paradise Bird (*Seleucides alba*). About twelve posterior plumes have the midrib elongated into black wires, which curve backwards for about 10 inches. The female is not so plain as in most other species. The males are solitary in habit. These birds frequent flowering trees, are almost ceaselessly in motion, and feed to a large extent on the nectar of flowers. The great Epimache, or Long-tailed Paradise Bird (*Epimachus magnus*), 'has a magnificent tail, more than 2 feet long, glossed on the upper surface with the most intense opalescent blue.' Broad brightly coloured plumes spring from the sides of the breast. The rifle-birds, or rifleman-birds, of North Australia (*Ptiloris*), are gorgeous examples of the Long-billed Birds of Paradise. See RIFLE-BIRD.

These marvellously beautiful birds have some commercial importance. 'They are the monopoly of the chiefs of the coast villages, who obtain them at a low rate from the mountaineers, and sell them to the Bugis traders.' The skull and feet are usually removed, the skin is wrapped up in palm leaves, and dried in a smoky hut. The colour is often half-spoiled in the process. That the feathers are used for head-dress decoration has been already noticed.

The scientific interest of these birds is centred in the relation of the beauty of the males to their highly developed art of courtship. Wallace gives a vivid description of the excitement and display at pairing time. They meet in what the people call 'sacaleli,' or 'dancing parties,' on wide-spreading forest trees, with large but scattered leaves. A dozen or twenty fully-plumaged males then display their beauty in every variety of attitude and motion. It is believed that the males were originally like the females, as they generally are when young. Changes in colour and form gave certain males a preference in the eyes of the selecting females. The more attractive became the more successful breeders, and thus the development of their beauty is laid to the credit of their courtship. The real origin of the colour in the mature males still requires elucidation; the theory of sexual selection only shows how changes once started might be gradually accumulated and enhanced.

The birds of paradise are restricted in distribution as above noticed. Their home (New Guinea) is rugged and mountainous, and in its recesses almost inaccessible. The people are savages. 'In such a country,' says Wallace, 'and among such a people, are found these wonderful productions of nature, the birds of paradise, whose exquisite beauty of form and colour, and strange development of plumage, are calculated to excite

the wonder and admiration of the most civilised and the most intellectual of mankind, and to furnish inexhaustible materials for study to the naturalist, and for speculation to the philosopher.' See A. R. Wallace, *Malay Archipelago* (vol. ii. 1869); Elliot, *Monograph of Paradiseidæ* (1873).

Bird's Eye. See PRIMROSE.

Bird's-eye Limestone (so called from the crystalline points disseminated through the rock) is a division of the Trenton group of the Lower Silurian of North America, containing, besides the remains of brachiopods, many enormous orthoceratites.

Bird's-eye View is a term applied generally to modes of perspective in which the eye is supposed to look down upon the objects from a considerable height. In sketching or drawing a locality for military or economical purposes, this kind of perspective is always used. The great difficulty is to represent at the same time the relative heights of mountains and steepness of acclivities. But the more usual kind of bird's-eye view differs from the common perspective picture only in the greater height of the horizontal line.

Bird's-foot (*Ornithopus*), a genus of Leguminosæ, sub-order Papilionaceæ, deriving both its popular and its botanical name from the resemblance of the curved pods to birds' claws; the leaves are pinnate, with a terminal leaflet. The Common Bird's-foot (*O. perpusillus*) grows on dry sandy or gravelly soils, and is a small plant of little importance, although eagerly eaten by sheep. But *O. sativus*, an annual growing to the height of 2 or 3 feet, a native of Portugal, is cultivated in that country as green food for cattle, and is very succulent and nutritious. Like its British congener, it grows well on very poor soils. Its Portuguese name is Serradilla.

Bird's-foot Trefoil (*Lotus*), a genus of Leguminosæ, sub-order Papilionaceæ. The English name is derived from the resemblance of the clusters of pods to a bird's foot. The common species (*L. corniculatus*) is very abundant everywhere in Britain in pastures. It has a stem 6 to 12 inches in length, decumbent, and bearing umbellate heads of 8 to 10 yellow flowers, which have a rich honey-like smell. The plant has been sometimes regarded as



Bird's-foot Trefoil.

the Shamrock (q.v.) of Ireland. It is eaten with great avidity by cattle, and its deeply penetrating roots adapt it well for very dry situations.—A

larger species, otherwise very similar, with stem nearly erect, more compact heads of smaller flowers, and smaller seeds, is the Greater or Narrow-leaved Bird's-foot Trefoil (*L. major*), which also is a common native of Britain, generally found in moist, bushy places. The Winged Pea (*L. Tetragonolobus*), often separated as the type of a distinct genus on account of its quadrangular winged pods, is a native of the south of Europe, and was formerly cultivated in Sicily and Spain as an esculent; it is sometimes sown as an annual in flower-borders in Britain.

Bird's-nest is a name applied to two or more distinct plants, of similarly brownish colour and leafless habit, which are root-parasites, and grow more or less concealed under other vegetation. *Neottia* (*Listera*) *Nidus-avis*, the bird's-nest orchis, grows in dark woods, especially beech; *Monotropa Hypopitys*, a rare ericaceous plant, also grows in beech or fir woods. There is also a bird's-nest fern (*Asplenium Nidus*); and a group of Gasteromycete fungi, the *Nidulariæ* (Cyathus, Nidularia), from their cup-shape and egg-like spore-bearing masses, have also acquired the same popular name.

Birds of Prey. See BIRD; also FALCON, VULTURE, EAGLE, SPARROW-HAWK, &c.

Birdwood, SIR WILLIAM RIDDELL, born 1865, served in various Indian wars and in South Africa. He commanded the Australians and New Zealanders at the Dardanelles and in France, and later the fifth army in France. In 1920 he returned to India, to the northern command.

Biretta (Ital. *berretta*; dim. of Lat. *birrus*, 'a hooded cloak'), a square cap worn by the clergy of the Roman Catholic Church, and by some ritualists in the Anglican Church. That of priests is black, of bishops purple, of cardinals red. Originally round, its present form, with straight, erect edges, and a tuft or button on the crown, dates only from the 17th century; but the low head-covering of English bishops was known as the *bir-ettum* as early as the 13th century.



Biretta.

Birkbeck, GEORGE, M.D., distinguished for the leading part he took in founding Mechanics' Institutes (q.v.) and in the education of the working-classes, was born at Settle, in Yorkshire, in 1776. He studied medicine at Leeds and Edinburgh. Appointed in 1799 to the chair of Natural Philosophy in the Andersonian Institution in Glasgow, he delivered his first free course of lectures to the working-classes in the following year. He took a leading part, along with Brougham, Bentham, Cobbett, and others, in the formation of the London Mechanics' Institute (1824)—the first of its kind in the kingdom, long called the Birkbeck Institution, and now developed into the Birkbeck College, a polytechnic aided by the London County Council. He died 1st December 1841. See Life by Godard (1884).

Birkenfeld, a former principality named from its capital, attached to Oldenburg (q.v.), but surrounded by the Prussian Rhine province, with an area of 192 sq. m., and a pop. of 50,000.

Birkenhead, a seaport and parliamentary and county borough of Cheshire, opposite Liverpool (q.v.), on the left bank of the Mersey, owes its origin to the 12th century Benedictine Priory of *Byrkhed*. Still in 1818 only a few straggling houses existed, and in 1821 the population was only 236. In 1836 it received the grant of a market; in 1861 obtained the privilege of returning a member to parliament, in 1918 two members; in 1877 was created a municipal, in 1888 a county, borough. The Park (1867), in Cloughton, is 190 acres in extent; Mersey Park, in Tranmere, of 29 acres, was opened in 1885. Notable buildings are the market-hall, the town-hall, the sessions and police courts, the borough hospital, the free library, and the public baths. A railway bridge over the Mersey at Run-corn (1869), shortened by 10 miles the distance between the Liverpool and Birkenhead docks; the Mersey railway tunnel, 1230 yards long, was opened in 1886; but the ferry-steamers are very important still. In 1824 Laird & Son purchased from the Liverpool corporation a large piece of ground on the borders of the Wallasey Pool; but it was not till 1847 that the first dock constructed by the Birkenhead Dock Company was opened. In 1857 the docks at Birkenhead were amalgamated with those of Liverpool. Including the Great Float (over 140 acres), they extend a distance of a mile, the total water area being 170 acres, with 9½ miles of quays. Much coal is shipped from the port, also manufactures of various kinds; and grain and cattle imported. To the ship-building-yards of the Messrs Laird the town largely owed its development. Near the docks are great bridge works, machinery works, engineering works, oil-cake mills, flour-mills, and breweries. Birkenhead has a school of science and art, a technical school, and a museum and art gallery. St Aidan's College, an Anglican theological college, is in the suburb of Cloughton. Pop. (1871) 65,971; (1891) 99,857; (1911) 130,794; (1921) 145,592.

Birkenhead, FREDERICK EDWIN SMITH, first Earl of, a strenuous and brilliant Tory politician and lawyer, was born at Birkenhead, 12th July 1872, studied at Oxford, lectured on history, was called to the bar, sat for Liverpool (Walton) 1906-19, worked vigorously for the Ulster die-hards, and fought in the Great War. In the Coalition Governments he was Solicitor-general (1915), Attorney-general (1915-19), and Lord Chancellor (1919-22), going out of office with Mr Lloyd George. He wrote on legal and political matters and on Newfoundland, and contributed to this encyclopædia.

Birmingham, chief seat of British metal manufactures and great hardware centre for the world, stands near the middle of England, 112 miles NW. of London. It was probably founded soon after the Saxon conquest of Mercia, but no mention of it has been discovered prior to that in *Domesday Book*. For centuries it was, no doubt, a cluster of huts around a moated manor-house on the banks of the Rea. The river is but a small one, but it was of great value in the earliest trade of the place, which was that of tanning; and, indeed, supplied the motive-power to all its machinery until the invention of steam-power, which was here brought to perfection.

Birmingham is the home of the hardware industry, everything from the most ponderous machinery to elegant trifles being made in quantity here. Amongst the eminently various manufactures are work in gold, silver, copper, brass, iron, steel, mixed metal, plated metal, glass, stained glass; japanned and electroplated goods; firearms—especially gun-barrels—ammunition, swords, metal ornaments, toys, jewellery, steel-pens, buttons, nails, screws, tools, locks, metal tubes, and machinery. Cycle-

making is an important industry, and motor-cars are largely produced. As Birmingham jewellers make some of the finest work in England, and much of the so-called 'London-made' jewellery is produced here, the sneering 'Brummagem'—first used of certain counterfeit coins made here in the 17th century—is hardly relevant.

Birmingham (*Beorning-ham*) appears in *Domesday* as *Bermingeham*. It formed one item in the great possessions given by the Conqueror to the Paganel family, whose chief seat was at Dudley Castle. The little town was given in feudal tenure to Paganel's 'dapifer,' or steward, who adopted its name. Throughout the middle ages the barons of Birmingham constantly appear as important public servants or soldiers, but they were at last reduced to one representative, who was fraudulently attainted in 1537, when the manor fell to the Northumberland family. In Leland's *Itinerary* (1538) it is described as 'a good market town,' in which 'there be many smiths, . . . loriners that make bittes, and a great many naylors.' In the Civil War it supplied the Parliamentarians with swords, and in 1643 it was taken by Prince Rupert, plundered, heavily fined, and in large part burnt. Sheffield gradually superseded Birmingham in cutlery, but in other metal manufactures the Midlands capital increased its variety and pre-eminence. Until the 19th century Birmingham had no corporate body, and only manorial government. This was, in fact, a principal cause of its rapid rise. Men of independent thought and energy found here a place full of vitality, but free from all the restrictions by which large towns were usually hampered. Baskerville the printer carried on his business here. Willmore and Pye, the engravers, and the painters David Cox and Burne-Jones, were Birmingham men. The famous Soho Works of Boulton and Watt were at Handsworth near Birmingham, and were lighted with gas by Murdock in 1802. The Birmingham Musical Festival, repeated every three years since 1768 until the war, was at first associated almost exclusively with Handel's music; Mendelssohn conducted *St Paul* here in 1837, and his *Elijah* was composed for the festival of 1846, when he again conducted; Gounod's *Redemption* and *Mors et Vita* were both produced here for the first time; Elgar's *Dream of Gerontius* was first given at Birmingham in 1900, and *The Apostles* in 1903. The celebration by Radicals in 1791 of the capture of the Bastille led to a serious riot, when the upholders of church and king attacked the house of Dr Priestley, then Unitarian minister here, and destroyed his library. Several other houses were burnt, including that of William Hutton, who became the first historian of the town. Thomas Attwood originated here the famous Political Union, which hastened the passing of the Reform Act of 1832, and secured the enfranchisement of Birmingham; and the town has become the headquarters of a school of politics of which the watchword is the government by the people for the people. Amongst inventors are the names of Gillott, Mason, Elkington, and Chance; Angell James, Dr Dale, and George Dawson were ministers here; Archbishop Benson was born in the town, Bishop Westcott near it, and both were educated at King Edward's school, as was also Bishop Lightfoot; and at the oratory of St Philip Neri, established by him, John Henry Newman made his home from 1848 (save during his Dublin sojourn in 1854-58) till his death there in 1880. Incorporated in 1838, Birmingham became an assize town in 1884, and a county borough in 1888; and in 1911 was greatly enlarged in area under the 'greater Birmingham' scheme, so as to include the borough of Aston Manor, the urban districts of Handsworth, Erdington, and King's Norton and

Northfield, and the rural district of Yardley. Its dimensions are now about 12 miles at its greatest length and 7 at its greatest breadth. At the same time an important reform was introduced in poor law administration, whereby practically the whole area of the city was unified in one extensive parochial authority, with a very complete equipment in the way of infirmaries, children's homes, and an institution for the mentally defective. Birmingham was made the see of an Anglican bishop in 1904, and of a Roman Catholic archbishop in 1911. The articles on Chartism, Watt, Priestley, Newman, Bright, and Chamberlain illustrate episodes in the history of the city.

A municipal, parliamentary, and county borough, with (since 1896) a Lord Mayor for chief magistrate, it had in 1875, when Mr Chamberlain was mayor, entered on a period of remarkable municipal, social, and sanitary development. The parliamentary representatives have been increased from three (1867) to seven (1885), and to twelve (1918, for the county borough area). The 1921 census places it third among the great cities of the United Kingdom.

A large overcrowded and unwholesome area has been superseded by wide, handsome streets and fine buildings; some 3000 polluted wells were closed, and an abundant water-supply derived from an extensive gathering-ground in Wales, in the neighbourhood of Rhayader, from whence the water is conveyed to the town by an aqueduct over 73 miles long. This great engineering enterprise was completed in 1904, at a cost of £5,884,918, but a fresh aqueduct has become necessary, and is in process of formation. The sewage system is effective and economical; gas (1875) and electricity (1899) have, like the water-supply, been municipalised, and the corporation has erected baths and wash-houses, hospitals and asylums, markets and slaughter-houses. Under the Housing and Town-Planning Act of 1909 Birmingham has taken a foremost place among English towns in this movement. In addition to the voluntary efforts undertaken in two 'garden city settlements,' in which a prominent part has been taken by the Cadbury family, the corporation has carried into effect town-planning schemes in three large areas on the outskirts of the town. Birmingham, which is served also by various canals, is a principal station on the North-western, Midland, and Great Western systems; the new (1913) Great Western station at Snow Hill cost over £900,000. A crematorium was established in 1903. There are more than a dozen public parks and several other gardens and recreation grounds in or near the town; in addition to which the corporation has acquired an area of 120 acres of fine open common at the Lickey Hills, about 8 miles from the centre of the town. The corporation owns the tramway service, which now extends to 71 miles of route. It has also founded a municipal bank.

The town-hall dates from 1832-52; the municipal buildings (1874-78) comprise a council house and art gallery (the latter opened in 1885); and the Mason College (University) buildings complete an imposing group. Other noteworthy edifices are the General Hospital (1897), (Wesleyan) Central Hall (1903), the Exchange, the Victoria (Assize) Courts, the Midland Institute, the Post-office, the County Court, the City Education Department offices, and the New Street Railway Station. St Martin's (13th century; rebuilt and consecrated 1875) is the mother-church; St Philip's, a finely situated edifice in the style of Wren, with its Burne-Jones windows, was in 1904 selected to be the cathedral; St Chad's is the Roman Catholic cathedral; and there are in all about two hundred and seventy churches of all denominations, over a hundred of them (including mission chapels) belonging to the Church of England. Free libraries

in Birmingham date from 1860-61; and the central institute and its twenty branches possess half a million volumes. The Shakespeare Library is one of the finest in existence, and has many bibliographical treasures. There are also large photographic collections, and a library of lantern slides which are lent out to illustrate lectures.

The schools of King Edward VI. comprise a free boys' school, a high school for girls, together with several middle or grammar schools. Mason's College, founded in 1875 by Sir Josiah Mason to promote 'thorough systematic education and instruction, specially adapted to the requirements of the manufactures and industrial pursuits of the Midland district,' was opened in 1880, Latin and Greek having been added to the science classes. In 1882 and 1892 Mason's College took over most of the scientific and all the medical teaching of the Queen's College (1867); and in 1898-1900 Mason's College was merged in Birmingham University, for which, by 1899, £325,000 was subscribed, the charter being applied for and obtained in the same year, and Sir Oliver Lodge being appointed the first principal. Commerce, science, and arts rank as departments of one joint faculty, medicine being the second; provision was made for engineering in the building erected for the science department, opened in 1909.

The Municipal School of Art has its principal building close to the municipal offices, and there are eleven branch schools. The art gallery adjoins the council house, and has very fine and extensive collections. The Pre-Raphaelite school is well represented. The paintings in oil and water-colours are more than 1200 in number, and there are also large collections of drawings and etchings. An excellent natural history museum is in the same building, the collection of stuffed birds being remarkably fine. There is also a Society of Artists of long standing, which holds exhibitions twice a year. The Midland Institute, greatly developed in 1885, has a most flourishing school of music, and other educational agencies; and there is a great Municipal Technical School, founded in 1893.

The population, which in 1770 was 30,806, by 1801 had increased to 60,822, by 1851 to 232,841, by 1871 to 343,787, by 1881 to 400,774, by 1891 to 478,113, by 1911 to 840,202, and by 1921 to 919,438.

See Hutton's *History of Birmingham* (1781); Griffith's *History of the Free Schools, Colleges, Hospitals, and Asylums of Birmingham* (1861); Timmins's *Resources, Products, and Industrial History of Birmingham* (1866); Langford's *Century of Birmingham Life* (1868); Dent's *Old and New Birmingham* (1879-80) and *The Making of Birmingham* (1894); Bunce's *History of the Corporation of Birmingham* (2 vols. 1878-85; 3d vol. by Vince, 1902); *Birmingham Institutions*; University Lectures, edited by J. H. Muirhead (1911); J. H. B. Masterman's *Birmingham* (1920); and Shaw's *Municipal History in Great Britain* (New York, 1895).

Birmingham, the capital of Jefferson county, Alabama, and the most important seat of the iron industry of the southern states, is situated at the junction of several railways, 95 miles NNW. of Montgomery, with numerous foundries, mills, factories, and machine-shops. Pop. (1880) 3086; (1890) 26,178; (1920) 178,806.

Birnam, a Perthshire hill 1324 feet high, near Dunkeld, commanding a splendid view of the valley of the Tay. Birnam Wood is immortalised by Shakespeare in *Macbeth*. Opposite Dunkeld is the pretty village of Birnam.

Biron, the title of a family that has given several marshals to France. The most distinguished are these: (1) ARMAND DE GONTAUT, BARON DE BIRON, born in 1524, fought against the Huguenots at Saint-Denis and Moncontour, but

early joined and rendered great service to Henry IV. He was killed at the siege of Epemay in 1592. His *Correspondance* was edited by Barthélemy in 1874.—(2) CHARLES DE GONTAUT, DUC DE BIRON, son of the preceding, was born in 1562. His intrepid valour gained him the affection of Henry IV., and the nickname of 'Fulmen Gallie'; but being convicted of a treasonable correspondence with Spain, he was beheaded in the Bastille in 1602.—(3) ARMAND LOUIS DE GONTAUT, DUC DE BIRON, born in 1753, fought with Lafayette in America, joined the Revolutionists in France, for whom he commanded several armies, and defeated the Vendéans at Parthenay in 1793. Accused, however, of oppression and falsehood by two fellow-generals, he was guillotined, 1st January 1794. His *Mémoires* (new ed. by Lacour, 1858) are valuable.

Biron, ERNEST JOHN DE, Duke of Courland, born in 1690, was the son of a landed proprietor in Courland, of the name of Bühren. When his mistress, Anna Ivanovna (q.v.), ascended the throne of Russia in 1730, Biron assumed the name and arms of the French dukes De Biron, and swayed all Russia most despotically, but introduced vigour into every branch of the administration. On the death of the empress in 1740 Biron assumed the regency, but three weeks after was arrested and sent to Siberia. On Elizabeth's accession (1741) he was recalled, and died in 1772.

Birr. See PARSONSTOWN.

Birrell, AUGUSTINE, was born at Wavertree, near Liverpool, 19th January 1850. He graduated at Trinity Hall, Cambridge, in 1872. Admitted to the bar in 1875, he was made Q.C. in 1893, and from 1896 to 1899 was Quain professor of Law in University College, London. In 1889-1900 M.P. for West Fife and in 1906-18 for North Bristol, he was President of the Council of Education (1906) and Irish Secretary (1907-16), introduced the Education Bill of 1906, carried the Irish Universities Act of 1908, and resigned after the Sinn Féin rising (1916). Among his writings are *Obiter Dicta* (1884, 1887); *Life of Charlotte Brontë* (1885); *Res Judicatae* (1892); *Men, Women, and Books* (1894); *Sir Frank Lockwood* (1898); *Miscellanies* (1901); *William Hazlitt* (1902); *Frederick Locker Lampson* (1920); *Collected Essays* (1922).

Birrens, a Roman station in Dumfriesshire, 1½ mile ENE. of Ecclefechan. Excavations have yielded interesting remains. Some identify it with Brunanburh, scene of Æthelstan's victory (937).

Birs-i-Nimrud. See BABEL, BABYLONIA.

Birth is generally applied to the delivery of a living child, and not to the mere expulsion of an ovum, or fetus, or dead child. Numerous medico-legal questions of importance may arise regarding the real or supposed birth of a child. Only a few points regarding the most common of these can be touched on here. (a) Has the supposed mother been delivered of a child? Was it at or about the time alleged? The fact of delivery is often concealed; sometimes it is falsely asserted. It is only for about eight or ten days after birth that, in the case of a healthy woman, physicians can tell with any accuracy the time at which delivery has taken place. It is, however, generally possible to say whether or not a woman has had a child at some time or other; so that delivery which is feigned for the purpose of extorting charity, compelling marriage, or disinheriting other parties can generally be detected by medical jurists. (b) Was the child mature when born? or sufficiently developed for it to live? A child reaches maturity about nine months after conception, when the head is covered with hair, and the finger-nails are completely formed; the average length is 18 inches, and

weight between 6 and 7 lb.; but wide deviations from these figures are met with. It is very rare for a child to live more than a few hours if born before the end of the seventh month from conception. (c) Was the child born alive? how long did it survive its birth? (see INFANTICIDE). With regard to questions of inheritance, a child is considered capable of taking and transmitting property, if it has lived for an instant, although it may not have cried or moved. See ABORTION, BASTARD, HEIR, ILLEGITIMACY, INFANTICIDE, LEGITIMATION, REPRODUCTION; for Birthright, see FAMILY, FIRST-BORN, FEUDALISM, SUCCESSION; and for Registration of Births, see REGISTRATION.

CONCEALMENT OF BIRTH is a criminal offence in the law of all civilised countries. In England, under the Offences against the Person Act of 1861, every person who endeavours to conceal a birth by a secret disposition of the dead body of the child is liable to be imprisoned, with or without hard labour, for any term not more than two years. It is not necessary to prove whether the child died before, at, or after its birth. To constitute the crime the child must be so far developed as to have had a fair chance of life when born. Concealment includes the case of the body being laid down in an unfrequented place though not hidden. Many cases dealt with are undoubtedly cases of murder through exposure. A verdict of concealment of birth can be returned on an indictment charging murder.

In Scotland, under an act of 1690, concealment of birth was construed as presumptive of child-murder, and punished with death, in all cases where a woman concealed her being with child during the whole period of her pregnancy; where she did not call for, or make use of, help or assistance in the birth; and where the child was found dead, or was missing. The case of Tibby Walker (the 'Effie Deans' of Scott's *Heart of Midlothian*) is a familiar instance. The capital penalty was first superseded by banishment; and now, by a statute of 1809, the woman is liable to imprisonment for a period not exceeding two years. Of course, this law does not apply to cases of premature birth, at least where the offspring cannot properly be called a child. In both England and Scotland the law is dictated by a desire not to press charges of murder against unfortunate women. In England, only the secret disposal of the body is punished; mere denial of the birth is not punishable. In Scotland disclosure of the pregnancy to any one exempts the woman from punishment. It has been decided that disclosure by the mother to the putative father, or even conduct implying disclosure, or confession before a kirk-session, is a sufficient defence. The punishment usually awarded for this offence in Scotland is imprisonment from three to six, and in aggravated cases from nine to eighteen, months. See INFANTICIDE.

Birth, REGISTRATION OF. See REGISTRATION.

Birthday Books began in 1866 with the *Birthday Scripture Text-book* issued by W. Mack, bookseller, Bristol, who was also its joint-compiler. Success was immediate, and by 1888 about a million copies had been sold, besides about half a million of others issued by him later. His plan, soon widely imitated, was to issue a daily Scripture text-book, interleaved for the autographs of friends. Soon all the chief poets and prose-writers were laid under contribution for the like purpose. The idea was extended to include illustrations.

Birthwort. See ARISTOLOCHIA.

Biru', WALATA, or VALATA, an oasis in the Sahara, in French Sudan, 260 miles W. by N. of Timbuktu, with one considerable town and an active trade.

Bisac'cia, a town of Italy and bishop's see, 60 miles E. of Naples; pop. 8000.

Bisacquino, a town of Sicily, 27 miles S. of Palermo. Agate and jasper are found in the neighbourhood. Pop. 10,000.

Bisahir. See BASHAHR.

Bisalnagar, or VÍSNAGAR, a town of Baroda, in Bombay Presidency, headquarters of a taluka of the same name, and a great centre of trade in the state; pop. 14,000.

Bisalpur, a town of India, in the United Provinces, 24 miles E. of Bareilly; pop. 10,000.

Biscacha. See VISCACHA.

Bis'cay, or VIZCAYA, the most northerly of the Basque Provinces of Spain, is bounded N. by the Bay of Biscay, E. and S. by its sister-provinces, Guipúzcoa and Alava, and W. by Santander (see BASQUES, FUERO). It has an area (very mountainous in the south) of 849 sq. m., and a population of 400,000; chief town, Bilbao (q.v.).

Biscay, BAY OF (Fr. *Golfe de Gascogne*), part of the Atlantic Ocean which washes the northern shores of the Spanish peninsula and the west of France. Its extreme width is about 400 miles, and its length much about the same. The depth reaches 200 fathoms off the Spanish coast. The whole of the south coast is bold and rocky, and great parts of the French shores are low and sandy. The bay receives numerous unimportant streams from the mountains of Spain, and, through the rivers Loire, Charente, Gironde, and Adour, the waters of half the surface of France. Its chief ports are Santander, Bilbao, and San Sebastián, in Spain; and Bayonne, Bordeaux, Rochefort, La Rochelle, and Nantes, in France. Navigation of 'the bay' is proverbially trying to inexperienced voyagers, and is frequently rendered dangerous by the prevalence of strong winds, especially westerly ones. Rennel's Current sweeps in from the ocean round the north coast of Spain.

Bisceglie, a seaport of Italy, on the Adriatic, 21 miles NW. by W. of Bari, has a cathedral (12th century), seminary, hospital, &c.; pop. 32,500.

Bischof, KARL GUSTAV (1792-1870), born near Nuremberg, became professor of Chemistry in Bonn, and wrote treatises on botany, chemistry, and geology, the chief being a *Manual of Chemical and Physical Geology*. In 1837-40 he made important experiments on inflammable gases in coal-mines, and on safety-lamps.

Bischoff, MOUNT, a mining district in north-western Tasmania, about 60 miles W. of Launceston. In the hill from which the district takes its name Mr James Smith in 1871 discovered what is probably the richest tin-mine in existence; it is worked as an open quarry, and in course of development a large part of the original hill has been removed. Mount Magnet is in the neighbourhood, and Zeehan (q.v.) about 40 miles farther south. The post-town is Waratah. Communication is by a branch line, 10 miles long, from the Burnie-Zeehan railway, a private line owned by the Emu Bay Railway Company.

Bischoff, THEODOR LUDWIG WILHELM, an eminent anatomist and physiologist, and more especially embryologist, was born at Hanover, 28th October 1807. He studied at Bonn and Heidelberg, becoming in 1836 extraordinary professor and in 1843 ordinary professor of Anatomy and Physiology at Heidelberg. From 1844 to 1855 he filled the like chair at Giessen, where he founded a physiological institute and anatomical theatre, and from 1855 to 1878 at Munich. In the latter year he retired, and he died at Munich, 5th December 1882.

Bischweiler, a town of Alsace, on the Moder, 17 miles N. of Strasburg. Its fortifications were dismantled in 1706. It manufactures jute, cloth,

carpets, and cartridge-cases, and raises hops. Pop. 9000.

Biscop. See BENEDICT BISCOP.

Biscuit is the name given to porcelain and other Pottery (q.v.) after the first firing.

Biscuit-root, a genus (*Camassia*) of Liliacæ whose bulbs ('quamash') are eaten by the Indians of north-west America.

Biscuits (Fr., 'twice-baked'), small, flat bread, rendered dry and hard by baking, in order to their long preservation. Biscuit-baking is rapidly becoming an industry in itself, and factories are rising up all over the country where biscuits are made in large quantities. In these factories the flour and other ingredients of which biscuits are made is never handled from the time it enters the works until it issues from them as a finished article. In the case of hard biscuits the various ingredients are run into a kneading-machine, where they are thoroughly incorporated into a stiff dough. This is then 'braked'—i.e. passed and repassed between rollers until pressed into long sheets with smooth surfaces. These sheets are then placed on a biscuit-cutting machine, which is provided with a pair of rollers set to compress the dough as it passes between them into the desired thickness. The dough is carried along by a woollen or canvas web, which delivers the dough underneath a block containing cutters which descend and cut the biscuits to the desired shape. As the block rises, the web carries the cut dough onwards, the scrap dough being collected; they next pass on to a wire frame travelling through a heated chamber or oven. The passage through the oven occupies about fifteen minutes, during which time they are completely baked. They are then carried to the packing-room, and when cool at once packed in tins. So rapidly is this operation conducted, that about 2000 lb. weight of biscuits are passed through one of these ovens every day of ten hours.

Biscuits are divided into two classes—the *unfermented* and the *fermented*. *Unfermented* or *unleavened* bread, generally known as *common sea-biscuits* or *ship-bread*, are made of wheaten-flour (retaining some of the bran), water, and common salt.

Captains' biscuits are prepared from wheaten-flour, water, with common salt, and butter, with an occasional small dose of yeast to cause partial fermentation. Milk is also sometimes employed. *Water biscuits* are made of flour and water; *hard biscuits*, of flour and water, with variable quantities of butter, spices, and sugar. *Soft biscuits* contain increased quantities of butter and sugar. *Yeast biscuits* are those the dough of which is mixed with a small quantity of yeast, yielding more porous biscuits. *Butter biscuits* are made with much butter and a little yeast.

In making fancy biscuits great care must be taken in the manipulative part of the process to incorporate the ingredients in a systematic manner. Thus, the butter is mixed with the flour in a dry condition, and then the water or milk added; and when eggs are used, they are thoroughly beaten up with the sugar (if the latter is required), and the egg-paste added to the dough, which has been previously prepared with or without butter. The various kinds of biscuits in the preparation of which yeast is employed, present a more spongy aspect than the unyeasted biscuits. Occasionally a little sesquicarbonate of ammonia (volatile salt) is added, to assist in raising the dough, and make a lighter biscuit. A great objection, however, to fermented biscuits is that they deteriorate very rapidly on keeping.

Soft or *spiced biscuits* are prepared from flour, with much sugar, a great many eggs, some butter, and a

small quantity of spices and essences. The eggs tend to give a nice yellow cream-colour to the biscuits.

The extent to which biscuits are now consumed may be learned from the fact that several of the largest biscuit-manufactories each prepare and throw into market every week from 30,000 to 50,000 lb. weight of biscuits of various kinds.

Of biscuits requiring special methods of manufacture, we may mention 'meat biscuits,' 'digestive biscuits,' 'charcoal biscuits,' and what is known as the 'perfect food biscuit.' The *meat biscuit* has not met with much favour as an article of food. It consisted of the usual ingredients of hard biscuit made up with a soup containing the soluble matters of beef. One of the objects of the meat biscuit—viz. the preservation of animal food of South America and Australia, has been attained by other preferable methods (see PRESERVED PROVISIONS). A coarse kind of meat biscuit is used for feeding dogs.

Digestive biscuits are prepared in such a manner that they may contain diastase, the nitrogenous transforming matter of malt; but whatever quantity of this substance they may contain in the condition of dough is destroyed in the process of baking.

Charcoal biscuits contain wood charcoal incorporated in their substance. The wood charcoal usually acts as an absorbent of gases, but it loses this quality when saturated with moisture; and it is in this condition, of course, that it reaches the stomach. Any benefit that may accrue therefore from the use of charcoal biscuits cannot be due to its absorbent powers. It may, however, be of some benefit by acting as a mild mechanical irritant.

Biscutella, a genus of yellow-flowered Cruciferae, consists of about a dozen species, growing in the Mediterranean region, south and central Europe.

Biserrula, a leguminous plant of the Mediterranean region, whose fruit resembles a centipede, whereby, according to some, it is disseminated by birds, which drop it when they discover their mistake.

Biserta. See BIZERTA.

Bish, BISHMA, or BIKH. See ACONITE.

Bishop. The word comes to us from the Old English *biscop*, an abbreviated form of the Greek *episkopos*—i.e. 'overseer.' In classical writers, from Homer downwards, it signifies an inspector or superintendent of any kind, though they also use it as a title of various officers with special and determinate functions—e.g. of commissioners sent by the Athenians to regulate the affairs of colonies and subject states, and of magistrates who superintended the sale of provisions in the market under the Roman empire. In the Septuagint the usage of the word corresponds, on the whole, to that in classical writers. Sometimes the sense is quite general, as when, for instance, in Job, xx. 29, it occurs as a name for God who watches over the conduct of men; but usually it denotes officers intrusted with the superintendence of some particular work, whether civil or religious. Had the history of the word ended here, it would never have come, as it actually has done, to form part and parcel of every language spoken by Christians of the East and West. It appears in Syriac and Arabic, in Spanish and German, and everywhere, even in the French *évêque*, the original Greek form may be recognised. While, however, the word itself has been retained, the sense attached to it has undergone a radical alteration. Throughout the New Testament *episcopus* is interchangeable with *presbyter*; both are synonymous titles of officers who direct the discipline and administer the affairs of a single congregation, but, from the latter part of the 2d century, it has assumed a widely different meaning, which it still retains. Instead of being synonymous

with presbyter, it implies superiority over a body of presbyters; instead of superintendence in a particular congregation, it suggests rule over a number of congregations united in a diocese. It has ceased to mark an office which may be held by many in the same place, and has been appropriated to one who is supreme over presbyters and laity within the confines of a diocese. A modern bishop occupies a position in his diocese which is unique. He alone ordains presbyters and consecrates churches. He exercises authority over clergy and laity alike. To him the duty of preaching and instructing, and of maintaining sound doctrine, is specially committed. A New Testament bishop or presbyter was the member of a council which watched over the government of a congregation. So far we are on secure ground. The proofs of the alterations which have affected the meaning of the term will be given further on. Meantime, it is enough to say that the fact is admitted by competent persons of every theological school, even by Roman Catholics, such as Döllinger, *First Age of the Church* (Eng. trans. p. 286), and is treated as probable by Estius on Philipians, and Petavius, *Ecclesiast. Hierarch.* lib. iv. cap. 2. 'The orders,' says Thomas Aquinas (on Philipians), 'were distinct, but not the names of the orders.'

The matter is indeed very different when we pass from the word 'bishop' to the history of the episcopal office. Thus, while the more learned Roman Catholics admit that the words 'bishop' and 'presbyter' are synonymous in the New Testament, they also allege that modern bishops are by divine right superior to presbyters, and are the successors, not of those who bear the same name in the New Testament, but of the apostles. The Council of Trent anathematises those who deny that bishops are superior to presbyters, or assert that the episcopal power of ordination is common to the latter (Sess. xxiii. can. 7). True, Roman Catholic divines make some distinction between bishops and apostles, whose successors they are said to be. It is admitted that the apostles had jurisdiction throughout the world, whereas the bishop's power is restrained to a particular diocese. But the bishop, like the apostle, ordains priests, rules over them and over the laity, and this by divine and unalterable institution. The position of High Church Anglicans is much the same. They consider episcopacy as necessary, not only to the well-being, but to the being of a church. To Anglicans of the more moderate school, episcopacy is a venerable form of church government which descends from apostolic times, but they do not count it an essential matter, and they have no mind to unchurch the Protestant communities which have been formed on another model. Presbyterians, on the other hand, contend that the government of the church by presbyters has, and has alone, the sanction of the New Testament, and they reject modern episcopacy as a corruption of primitive Christianity. But at all times the Protestant churches, whether Episcopalian, or Presbyterian, or Congregationalist, have had men among them who could adopt none of these positions; who believed that the free spirit of Christianity inculcates no definite form of church government, and have regarded the varying shapes which it has assumed as things indifferent in themselves, good or bad according to circumstances, never so good as to compensate in any degree for the absence of spiritual life, never so bad as to preclude its existence. And just as there have been men who forgot disputes about church government in the interests of the spiritual life, so there have been in England, and still more in Germany, scholars who have investigated the history of episcopal power with a learning and impartiality which

is not to be found in the war of the churches. We may say, briefly, that the result of all real investigation has been to show how utterly unlike the state of the earliest churches was to anything which either exists or could be reasonably desired at the present day. An attempt will be made here to state and to arrange the facts without entering into sectarian controversy. It must be premised that the whole tradition of the church, from the close of the 2d century onwards, tells, on a *prima facie* view, for the Roman Catholic and High Church theory of apostolical succession. Each cause has enlisted consummate learning on its side. But the method chosen here has at least the advantages that it is less familiar to the mass of English readers, that it has commended itself to scholars even within the pale of episcopal communions, and that it enables us to exhibit, without prejudice to any theory, the data by which all theory must be tested and proved.

Our earliest and surest sources of information are the undisputed epistles of St Paul, and there it is significant that the word 'bishop' occurs once only, and that in the latest of his epistles (Philip. i. 1). But in one important passage the apostle makes a formal enumeration of the different positions or grades occupied by the members of the church. We use of set purpose language which is vague, because, as we shall see presently, the powers indicated are vague, at least so far as the government of the church is concerned. 'God,' he says, 'hath set some in the church, first apostles, secondly prophets, thirdly teachers, then miracles, then gifts of healing, helps, governments, divers kinds of tongues' (1 Cor. xii. 28). It will be observed that he speaks of divine appointment, not of popular choice, and the reason is plain, for 'powers,' 'gifts of healing,' 'tongues,' 'prophecy,' were obviously miraculous gifts, and the same holds good, though perhaps in a lower degree, even of teaching, as appears from 1 Cor. xiv. 26; while Paul himself is a conspicuous example of an apostle, sent neither from men nor through human instrumentality, but by God 'through revelation of Jesus Christ' (Gal. i. 1-17).

Still the question remains whether the apostolic included the later episcopal office, and to this question diverse answers are given. Roman Catholics and many Anglicans reply in the affirmative. Presbyterians and many independent scholars also urge that there is scarcely a single feature common to the two. It is only, they plead, in the teeth of history that the distinction can be reduced to one between universal and local jurisdiction. The apostles had no universal jurisdiction; and their nearest counterpart, though even that is wide of the mark, is to be found in the modern missionary. The name of 'apostle,' which occurs once only in Matthew (x. 2), and once in Mark (vi. 30), oftener in Luke, was first given to the twelve. They were sent to the twelve tribes of Israel, and they continued this work, after the death of Jesus, in Jerusalem, and then throughout Judæa. The same name was taken by Paul after he 'had seen the Lord.' Among the Jewish congregations it was extended to James, the Lord's brother (Gal. i. 19), who had seen the risen Christ (1 Cor. xv. 7), and no doubt at a very early date to others, for Paul distinguishes 'all the apostles' as a larger class from the restricted number of the twelve. In the churches beyond Judæa, Timothy and Silvanus (1 Thess. i. 1, ii. 6), Barnabas (1 Cor. ix. 5), Apollos (1 Cor. iv. 6-9), Andronicus, and Junias (Romans, xvi. 7), were all apostles. Certain conditions seem to have been required before a man was generally recognised by this title. He must have

seen the Lord (1 Cor. ix. 1), approved himself by signs (2 Cor. xii. 12) and visions (2 Cor. xii. 1). The appointment, then, of an apostle, and the qualifications according to this view were wholly different from the appointment and qualifications of a bishop. No less different are the powers in the one case and the other. The bishop is the supreme administrator within the diocese in which he is nominated, being invested therein with supreme disciplinary authority. An apostle had no authority except over churches which he had founded. Paul, believing in the truth of his gospel, was ready to proclaim it to all, but the position he adopts to the Romans is quite other than that which he adopts to churches which owed their faith to him. He will not build 'on another man's foundation;' if he hopes to impart some spiritual gift to the Romans, he adds that the benefit will be mutual (Romans, i. 12), and he almost apologises for writing to them at all (Romans, xv. 15). It was his converts who were the seal of his apostleship (1 Cor. ix. 2). Even within his own sphere there is scarcely a resemblance between the authority of an apostle and a bishop. That of the former is much greater and much less, much greater in moral influence, much less in legislative authority. Paul's rights over his converts were those of a father who had begotten them in the gospel (1 Cor. iv. 15; Gal. iv. 19): it was his duty to remind them of the gospel they had received, accompanied and attested by the gifts of the Spirit, and to admonish them in case they were unfaithful to it (1 Cor. iv. 18-21, xiv. 37; 2 Cor. xiii. 2). When he has a distinct command of the Lord, he lays down an absolute precept. 'Unto the married,' he says, 'I give charge, yea not I, but the Lord, that the wife depart not from her husband . . . and that the husband leave not his wife' (1 Cor. vii. 10, 11)—appealing no doubt to a saying of Jesus preserved in the tradition of the disciples. On other matters, and those most important, he distinguishes between his own decision and that 'of the Lord,' and does but give his 'judgment' as 'one that has found mercy' (1 Cor. vii. 10-25). He also gives his own opinion as a spiritual man to whom the really spiritual will listen (1 Cor. xiv. 37, 38), and he refers to the general custom of the churches (1 Cor. xi. 16, vii. 17, iv. 17). But the congregation administered its own affairs in a completely democratic manner. The story of the incestuous Corinthian is a crucial instance. Paul is sure of what will take place; he is present in spirit at the meeting of the believers, but it is the meeting itself which passes sentence of exclusion. 'St Paul's spirit,' as Bishop Ellicott puts it, 'with the associated power of Christ, is present with the convoked synod, and with that synod passes the authoritative sentence' (Comm. on 1 Cor. v. 3). The older apostles had just as little official authority, just the same scope for moral influence. When Paul met them at Jerusalem in 51 A.D., they did not decide for the believers generally, but for themselves and their own course. They gave Paul and Barnabas 'the right hand of fellowship' that 'they should go unto the Gentiles.' Again, Paul felt he had to do, not with a board of officials, but with men whose past gave them great moral weight. In the second chapter of Galatians he never once uses the name 'apostle,' but he does mention 'the men of repute,' 'those who were reputed to be pillars.' Peter and John owed their position in great measure to their personal character, and James also to the fact that he was the brother of Jesus.

It may be objected that, anyhow, some official government must have been required in the early Christian gatherings, and that Paul implies that

there were persons who presided in the Thessalonian Church (1 Thess. v. 12). To which the answer is, 'That no doubt government existed, but that it was the government of those who were marked out for it by supernatural or natural gifts, not of officials.' We have seen already, that 'governments' are classed among the miraculous gifts of the Spirit. Further, the first converts, or those in whose house the church met (Rom. xvi. 5; 1 Cor. xvi. 19), would naturally direct the others, and take the lead in the congregation. 'I beseech you, brethren (ye know the house of Stephanas, that it is the first-fruits of Achaia, and that they have set themselves to minister unto the saints), that ye also be in subjection unto such, and to every one that helpeth in the work, and laboureth' (1 Cor. xvi. 15). Here the ministry or deaconship is one with the episcopate or superintendence. All is spontaneous, nothing official. The profusion of miraculous gifts prevented any desire for official teachers, and would have thrown them into the shade had they existed. Nor, some would add, could the apostles have thought of providing the churches with a regular government to last after their own death, though even so early a writer as Clement of Rome attributes this design to them. The fact, it is said, that the apostles, like the other Christians, confidently expected the coming of the Lord in their own time, proves this theory untenable.

Philippi was the earliest of the European churches, and there St Paul, towards the close of his life, does salute 'the saints' with the 'bishops and deacons.' Possibly, even then, these titles were beginning to be attributed, the former, to those who were the acknowledged leaders of the congregation; the latter, to those who devoted themselves to furthering and helping on its work. In later books of the New Testament canon, there is frequent mention of bishops or presbyters and deacons. And in the Acts the origin of these offices is traced back to the apostles themselves, and to the very beginning of the gospel. We are as yet, however, a long way from the Presbyterian system, because the office of teaching and preaching is quite separate from that of the presbyter. He was not a minister or preacher, but an 'overseer' or 'shepherd' of the church (Acts, xx. 28). He replaced the presbyters of the Jewish synagogue who presided over its discipline. And we are still further from diocesan episcopacy. Never once, from the beginning to the end of the New Testament, is 'a threefold ministry' of bishops, priests, and deacons so much as hinted at. On the contrary, bishop and presbyter are two words for the same office. The presbyters of Miletus (Acts, xx. 17) are also its bishops (verse 28); so are the presbyters in Crete (compare Titus, i. 5 with 7). The author of 1 Tim. iii. 7 having described the qualifications of a bishop, passes straight to those of the deacon, knowing nothing of any third office. True, it has been suggested—e.g. by Rothe (*Anfänge der Christ. Kirche*, p. 173, *seq.*) and by Bishop Lightfoot—that diocesan episcopacy may have sprung up at the close of the apostolic age. But it was unknown to Clement of Rome about 120 A.D. 'In his epistle,' says Bishop Lightfoot, 'there is no mention of episcopacy properly so called, for bishop and presbyter are still synonymous terms (see Clem. *Ep.* i. 44-47).' Precisely the same argument may be drawn from the 'Teaching of the Apostles' (xv.), and the Shepherd of Hermas (*Vis.* iii. 5). These authorities carry us well into the 2d century. An analogue to the diocesan bishop has been seen by some in the 'angels' of the Revelation. They are the guardian spirits of the churches, or possibly personifications of them, but not human rulers, as Bishop Lightfoot with others, before and since, has conclusively proved.

In the pastoral epistles, supposed by the more advanced critics to have been written in St Paul's name against the Gnostic heresies of the 2d century, we get closer to the point. There Titus and Timothy are certainly empowered to guard the faith, to appoint bishops or presbyters in every city, and to exercise authority over them. There is a tendency to identify the bishop or presbyter with the teacher or preacher, for the bishop is to be 'apt to teach' (1 Tim. iii. 2), but the identification is not yet complete, for it is taken for granted that only some bishops teach (1 Tim. v. 17). The recurrence of such phrases as 'sound doctrine,' and the position of Timothy and Titus, make us feel that we are already on the threshold of the Catholic Church with its rule of faith and its hierarchy. But even here much is lacking. Timothy and Titus are temporary delegates of the apostle, not diocesan bishops. It is in the Ignatian epistles that the Rubicon is passed, and here indisputably, in any case as early as the middle of the 2d century, the claims of bishops, in the modern sense, are insisted upon perpetually. It is useless to multiply quotations from writers of later date. By the time of Irenæus (190 A.D.), the diocesan episcopate was established throughout the Roman world. The old enthusiastic life of the early Christian meetings was replaced by the rule of the hierarchy. Even Ignatius had not reached the view which is familiar to Irenæus, and still more to Cyprian, that bishops are the successors of the apostles, and the channels through which primitive tradition is conveyed to successive ages. Thus, it is held by many, the Catholic Church arose, formed by a kind of necessity in the struggle against the exaggerated doctrines of the Gnostic sects, which threatened to dissolve Christianity in systems of fantastic and variable speculation. The canon or collection of New Testament books, with binding authority equal to that of the Old Testament, the episcopacy united with itself, the appeal to apostolic tradition, all arose from the same need, and on this triple foundation the Catholic Church was built.

Two other points, however, deserve notice. First, Jerome (died 420) (on Titus, i. 5; *Ep.* i. 46) and an earlier writer, whose works are printed with those of St Ambrose (on 1 Tim. iii. 8, 9, 10), perceived that bishops and presbyters had been originally one, and that the current distinction could claim no higher sanction than the custom of the church. Jerome's words, than which nothing can be more clear and strong, were incorporated in the *Decretum*, the earliest medieval collection of canon law (*Dist.* xciii. c. 24; xcv. c. 5), and thus all through the middle ages the schoolmen retained some idea of the real history of the office. Next, even in the 4th century, the church had not reached the modern principle that a bishop alone can confer valid orders. Thus, the Council of Ancyra in 314 A.D. (canon 13) assumes that presbyters may ordain presbyters with the bishop's sanction. The fathers of the council recognised of course the episcopal authority, but they did not attribute any supernatural efficacy to the imposition of episcopal hands.

The foregoing is a statement of the opinions, and the arguments on which these are based, held by the less conservative New Testament scholars both in England and Germany. Their argument has been given the more fully as still being much less known in England than the time-honoured High Church view, which has been for centuries the consistent theory of the whole Catholic Church. That theory of course is a perfectly simple and intelligible position, and the attitude of believers towards it depends mainly on the view they hold as to the literal interpretation of Scripture. For

apart altogether from the much wider and more difficult question, how far the general development in dogma of the whole body politic of the church is itself the outward evidence and expression of Christ's promised presence and guidance to the end of the world, the High Church theory of the apostolical succession of bishops—the representatives of the apostles, and through them of the Lord himself—finds strong support from the plain words of Scripture and the unforced exegesis of the same.

We must content ourselves with a brief summary of the later history of the office; and here it will be convenient to begin with the Roman Catholic and Eastern churches. There the duties and power of bishops remain much as they were in the middle of the 3d century, except so far as they have been curtailed by the rise of the papal power in the West, by the institution of Patriarchates and the interference of the state in the East. The Council of Trent requires the bishop to preach the word of God, and to maintain purity of doctrine among clergy and people. He has to superintend divine worship, and is bound to visit all the churches of his diocese at least once in every two years. He approves priests, and gives them faculties to hear confessions. He makes laws for his diocese, without power, however, to alter the common law of the church; decides ecclesiastical causes in the first instance; can suspend his clerical or excommunicate his lay subjects; he collates to all benefices, except those reserved to the pope; he directs the administration of temporal goods belonging to the diocese; he can dispense from his own laws, and, within certain narrow limits, from the law of the church. Such is the jurisdiction or ruling power of a bishop, but he is by no means supreme or unfettered even in his own diocese. He is subject by divine law to the councils of the church, and, as Roman Catholics believe, to the pope, and by ecclesiastical law he is in subordination to patriarchs, metropolitans, &c. In respect of orders—i.e. in power of consecration and the like—he has no superior, nor do pope or patriarch pretend to higher power than that of a simple bishop. He alone can consecrate other bishops, and ordain priests, and he alone, according to the Roman Catholic theory, is the ordinary minister of confirmation.

He is now addressed in the Latin Church as 'Most Illustrious and Reverend Lord,' though once titles which have become peculiar to the pope—e.g. 'Most Holy, Most Blessed Lord,' 'Your Holiness,' 'Servant of the Servants of God,' were common to mere bishops. His insignia are the ring, pectoral cross, episcopal throne, mitre, pontifical vestments, gloves, and sandals.

Bishops were in the earliest ages chosen by the people, subject to a veto by the bishops of the province (Cyprian, *Ep.* lxviii.). In 325 A.D. the first Nicene Council (canon 4) recommended appointment by the provincial bishops, subject to confirmation of their choice by the metropolitan. Greek canonists understood this canon as annulling the old form of popular election, and at present the Greek orthodox bishops are nominated by the patriarch, though in Russia the final nomination rested with the tsar. In the West the canon was understood to leave the popular rights of election unimpaired, merely requiring the presence of the bishops of the province, and confirmation by the metropolitan. In the 11th century the right of election passed to the Cathedral Chapter, and the pope gradually engrossed the sole right of confirmation, till at last Clement V. and his successors claimed the right of nomination also, first in certain cases, and then absolutely. Since then the pope has restored the right of election to the chapters in certain sees and countries. In others the head of the state

nominates. The election is purely papal in Belgium, also in Holland, Great Britain and Ireland, North America, and other Protestant countries. A right of recommendation, however, is conceded to the Roman Catholic chapters in Belgium, Holland, and England, to chapters and parish priests in Ireland, to the bishops of the province in North America. The right of consecration, which used to belong to the metropolitan and two other bishops, is now reserved to the pope, or a bishop nominated by him. There are about 200 archiepiscopal and 900 episcopal sees in the Roman Catholic Church. In Ireland there are 4 archbishoprics, 24 bishoprics; in England and Wales, 4 archbishoprics, 13 bishoprics; in Scotland, 2 archbishoprics, 4 bishoprics. Altogether there are about 200 Roman Catholic sees in the British empire. In the United States there are over 100. Besides these, there are the titular bishops, till the pontificate of Leo XIII. called bishops in *partibus infidelium*. They have received episcopal consecration, but have no regular jurisdiction. They assist some other bishop, or are delegates of the pope where the hierarchy is not established.

Passing to the Reformed churches, we find the theory of the Anglican much the same as that of the Roman episcopate, except that in England the authority of the crown has replaced that of the pope. The Anglican bishop is said, though the statement is disputed by Roman Catholic controversialists, to descend in direct line of consecration from his predecessors in the middle ages. He alone can ordain, confirm, and consecrate churches. He institutes to benefices and licenses curates; he has the right to preach throughout the diocese, to inspect the churches and churchyards. He can withdraw the licenses of curates, who may, however, appeal to the metropolitan. He is *ex officio* president in the Consistorial Court. With regard to criminous clerks his power is very limited, not only because the final decision rests with the King in council, but also because the English law protects the interests of the inferior clergy with a zeal unknown to the modern canon law of the Roman Church. Thus, whereas the Council of Trent permits a bishop to decide in cases of certain grave charges against clerks 'without formal trial, having simply ascertained the truth of the fact,' an Anglican prelate has no such power. He may institute a commission of inquiry, and decide the case with three assessors, one of whom must be a barrister, or he may at once prosecute in the Superior Court. If he himself passes sentence, an appeal lies to the Court of Arches in the province of Canterbury, to the Chancery in the province of York, and ultimately to the Privy-council. If a bishop refuses to institute a clerk to a benefice, the appeal is first to the archbishop and then to the Privy-council. There are in England two archbishops and about forty bishops, about as many bishops suffragan and assistant bishops, the archbishops and twenty-four of the bishops having seats in the House of Lords. There are two archbishops and eleven bishops in the disestablished Church of Ireland; seven bishops in the Episcopal Church in Scotland, one of whom is called Primus; one archbishop and six bishops (including the archbishop) in the disestablished Church in Wales (including Monmouth); about a hundred and twenty-five colonial and missionary archbishops and bishops; and about a hundred in the Episcopal Church of the United States.

The early Lutherans were singularly moderate and rational in their attitude to episcopacy. They denied its divine institution, but they were quite willing to tolerate it when circumstances made it expedient to do so. In Germany the name of bishop fell into disuse, or was retained as a merely civil title, or revived for a short time, and then

allowed to drop; and the Lutheran superintendent is a mere shadow of a medieval bishop. On the other hand, the Lutheran churches of Denmark and Scandinavia have always been episcopal. There are eight bishops in Denmark, nominated by the crown; one archbishop and eleven bishops in Sweden; six bishops in Norway, which last are chosen by the clergy; and one bishop in Iceland. These Lutheran bishops have the sole right of ordination, but in Sweden their disciplinary power is exercised in union with a consistory, the majority of whose members are laymen.

For the early history of the office, see Lightfoot on Philippians; Rothe, *Anfänge der Christlichen Kirche*, p. 261 seq.; Ritschl, *Entstehung der Altkatholischen Kirche*, p. 399 seq.; Baur, *Christenthum und Kirche der ersten drei Jahrhunderte*, p. 260 seq.; Hatch, *Organisation of the Early Christian Churches*; Weizsäcker, *Apostolisches Zeitalter*, p. 606 seq. The historical canonists of the Roman Catholic Church, such as Thomassin, afford abundant information on the episcopate in later patristic and medieval times. Dr Wordsworth's *Theophilus Anglicanus* and Gore's *Ministry of the Christian Church* are statements of the High Church theory; Döllinger's *First Age of the Church* treats the subject from the Roman Catholic standpoint. See also 'Episcopacy' by Darwell Stone in Hastings's *Encyclopædia of Religion and Ethics* (1913); the great *Catholic Encyclopædia* (15 vols. 1907-12); and for the Protestant position generally, the Hauck-Herzog *Real-encyclopædie für Protestantische Theologie* (1896-1909). See also the articles in this work on APOSTOLICAL SUCCESSION, ARCHBISHOP, ENGLAND (CHURCH OF), ORDERS, PRIEST, ROMAN CATHOLIC CHURCH. For Celtic episcopacy, see the sections on church history in the articles IRELAND and SCOTLAND.

Bishop. SIR HENRY ROWLEY, composer, was born in London, 18th November 1786. His principal musical instructor was Francesco Bianchi, an opera-composer settled in London. In 1806 Bishop was appointed composer of ballet music at the Opera. Among his 88 operatic entertainments were *Guy Mannering*, *The Miller and his Men*, *Maid Marian*, *Native Land*, and *The Virgin of the Sun*—all less remarkable for originality than for their flowing melodies and animated style. The opera *Aladdin* (1826) was a failure. The famous glee 'The Chough and Crow' is his; many popular songs, such as 'Should he Upbraid,' 'My Pretty Jane,' are by him; and his, too, probably, is 'Home, Sweet Home' (see PAYNE). From 1810 to 1824 he was director of the music at Covent Garden Theatre, from 1825 to 1830 at Drury Lane, and for three years more at Vauxhall Gardens. One of the first directors of the Philharmonic Society, he for nine years conducted the concerts of Ancient Music. From 1841 to 1843 he was Reid professor of Music in the university of Edinburgh. In 1842 he was knighted, and in February 1848 elected professor of Music in the university of Oxford. In his later years he was in very necessitous circumstances. He died of cancer, 30th April 1855. See *Life* by Richard Northcott (1921).

Bishop. ISABELLA. See BIRD.

Bishop-Auckland, an urban district in the county, and 9½ miles SW. of the city, of Durham, stands on an eminence 140 feet above the confluent Wear and Gaunness. Its abbey-like palace of the bishops of Durham was founded about 1300 by Bishop Antony Bek, and rebuilt by Bishop Cosin shortly after the Restoration. The town-hall is a handsome edifice of 1863, with a spire 100 feet high. There are engineering-works and large neighbouring collieries. Pop. (1851) 4400; (1881) 10,097; (1911) 13,834; (1921) 14,294.

Bishop's Cap, a North American and Japanese genus (*Mitella*) of Saxifragaceæ, with small greenish flowers in one-sided inflorescences.

Bishop's Castle, a municipal borough of Shropshire, 22 miles SW. of Shrewsbury. Till 1832 it returned two members to parliament. It is irregularly built on a hill slope. The bishops of Hereford had formerly a castle here. Pop. 1300.

Bishop's Falls, on the Exploits River, Newfoundland, 14 miles from its mouth, has great pulp-mills and paper-making works.

Bishop-Stortford, a town of Hertfordshire, on the Stort, 12 miles ENE. of Hertford. It chiefly consists of two streets in the form of a cross. It carries on a trade in grain and malt. Bishop-Stortford was in Saxon times the property of the bishops of London. Pop. 9000.

Bishop's Waltham, a town of Hampshire, 9½ miles SE. of Winchester. It has been immemorially the property of the see of Winchester. There are remains of a castle, built in 1135, by Bishop Henry de Blois, and reduced to ruins during the civil wars of the 17th century.

Bishopwearmouth. See SUNDERLAND.

Bishopweed, or GOUTWEED, also Goatweed, or Herb Gerard (*Agopodium Podagraria*), an umbelliferous weed common in hedges and grass plots, and exceedingly difficult of extirpation on account of its creeping rhizomes. It is eaten by cattle, and the leaf-stalks were formerly boiled and eaten as greens. The root-stock was long esteemed as a remedy for gout.

Biskra, a town of Algeria, 150 miles SW. of Constantine by rail, in an oasis watered by the Wady Biskra and by springs. It was known to the Romans as *Zaba*, and under the Moors it became a large town. It is now a favourite health-resort for Europeans. A railway runs south to Touggourt. At Biskra in 1663 some 71,000 persons died of the plague. Pop. 5000.

Bisley, a village of Surrey, 4 miles NW. of Woking; to Bisley Common were removed in 1890 the meetings of the National Rifle Association, and Bisley became 'the new Wimbledon.'

Bismarck, capital of North Dakota, is on the east side of the Missouri, here crossed by the Northern Pacific Railway on an iron bridge. Large quantities of goods are sent up the Missouri, which is navigable 1200 miles above Bismarck. Great sums have been spent by the government in digging out the sand-bars from the river above the town. Pop. 7000.

Bismarck Archipelago, the name officially given by Germany to New Britain, New Ireland, New Hanover, and several smaller adjoining islands in the South Pacific. In 1884-1919 they were a German dependency, now, with the rest of German New Guinea, under an Australian mandate. See NEW BRITAIN, &c.

Bismarck-Schönhausen, OTTO EDUARD LEOPOLD, PRINCE VON, DUKE OF LAUENBURG, chancellor of the German empire and foremost statesman of his time, was born 1st April 1815, at Schönhausen in Brandenburg, of an old family distinguished both in war and statesmanship. Bismarck received his university education at Göttingen, Berlin, and Greifswald, where he studied law and agriculture, but became more distinguished as a swordsman than as a reading man. After finishing his studies, he lived for a time on his estates. Before 1847 he was little heard of, but about that time he began to attract attention in the new Prussian parliament as an ultraroyalist, and a fierce but unsuccessful opponent of the constitutional demands resulting from the March revolution of 1848. He opposed the scheme of a German empire as proposed by the Frankfort parliament of 1849, for the reason that

the title to the imperial dignity offered to the king of Prussia was merely based on the popular will and not on the concurrent assent of the German sovereigns as well. His diplomatic career commenced in 1851, when he was appointed Prussian member of the resuscitated German diet of Frankfurt. Here he began to manifest that zeal for the interests and aggrandisement of Prussia, which thereafter undeviatingly guided him, often regardless of the means. In the diet he gave open expression to the long-felt discontent with the predominance of Austria, and demanded equal rights for Prussia. At Frankfurt he remained till 1859, when he beheld in the approach of the Italian war an opportunity of freeing Prussia and Germany from the injurious dominance of Austria; but his views of energetic action being not yet shared by the cautious and pacific prince-regent, Bismarck was meanwhile recalled from the diet and sent as minister to St Petersburg. In the spring of 1862 King William, on the urgent advice of the Prince of Hohenzollern, transferred Bismarck as ambassador to Paris, in order to give him an insight into the politics of the Tuileries, before intrusting him with the direction of affairs at home. During his short stay at Paris Bismarck visited London, and had interviews with the leading politicians of the time, including Lord Palmerston and Mr Disraeli. In autumn, when the king's government could not obtain the consent of the lower house to the new military organisation, Bismarck was recalled, to take the portfolio of the ministry for foreign affairs, and the presidency of the cabinet. Not being able to pass the reorganisation bill and the budget, he closed the chambers (October 1862), announcing to the deputies that the king's government would be obliged to do without their sanction. Accordingly, the army reorganisation went on; and the next four sessions of parliament were closed or dissolved in the same way, without the government obtaining, or even caring to obtain, the sanction of the house. When the 'Conflict Era,' as it was called, approached a crisis, the death of the king of Denmark re-opened up the Sleswick-Holstein question, and excited a fever of national German feeling, which Bismarck was adroit enough to work so as to aggrandise Prussia by the acquisition of the Elbe Duchies, and reconcile his opponents to his high-handed policy by pointing to the success of the newly-modelled army. Throughout the events which ended in the humiliation of Austria at the battle of Königgrätz (1866), and the reorganisation of Germany under the leadership of Prussia (see GERMANY), Bismarck was the guiding spirit; and such is the magic of success, that, from being universally disliked, he now became the most popular man in Germany. It was Bismarck that negotiated the neutralisation of the Luxemburg territory (1867).

The action of France in regard to the candidature of Prince Leopold of Hohenzollern for the throne of Spain gave Bismarck the opportunity of carrying into action the intensified feeling of unity amongst Germans. During the war of 1870-71, Bismarck was the spokesman of Germany; he it was that in February 1871 dictated the terms of peace to France. Having been made a count in 1866, he was now created a prince and chancellor of the German empire. From the peace of Frankfurt (10th May 1871) the sole aim of Bismarck's policy, domestic and foreign, was to consolidate the young empire of his own creating, by rendering its institutions more beneficent, authoritative, homogeneous, and stable; and again by securing it, through alliances and political combinations, against attack from without. Thus, conceiving the unity of the nation and the authority of its government to be endangered by the Church of Rome, and

its doctrines of Papal Infallibility, he embarked on that long and bitter struggle with the Vatican, called the Kulturkampf, in the course of which the Imperial and Prussian parliaments passed a series of most stringent measures (Falk or May laws) against the Catholic hierarchy. But Bismarck had underrated the resisting power of the Roman Church, and motives of political expediency gradually led him to modify or repeal the most oppressive of the anti-papal edicts, leaving the Catholics virtual masters of the field. Otherwise, his domestic policy was marked, among other things, by a reformed coinage, a codification of law, a nationalisation of the Prussian railways (as a preliminary step to Imperial state lines), fiscal reform in the direction of making the empire self-supporting (i.e. independent of 'matricular contributions' from its component states), repeated increase of the army and the regular voting of its estimates for seven years at a time (Military Septennate), the introduction of a protective tariff (1879), and the attempt to combat social democracy and socialistic agitation by means at once repressive and remedial—among the latter being a lightening of the burden of direct taxation, the insurance of working men against suffering from accidents, indigence, and old age, with other economic experiments, which have caused Bismarck to be called the greatest state socialist of the age. With a view to improve the finances of the empire, Bismarck repeatedly tried to establish various government monopolies, of tobacco, &c., but without success.

In 1884 Bismarck inaugurated the career of Germany as a colonising power, a new departure which brought him into sharp but temporary conflict with the England of Mr Gladstone. For the rest, his foreign policy aimed principally at isolating France and rendering her incapable of forming anti-German alliances. On the other hand, he gradually combined the central powers of Europe into a peace-league, aiming at counteracting the aggressiveness of Russia and France, separately or combined, on the Danube or the Rhine. The nucleus of this peace-league was formed in 1879 by the Austro-German Treaty of Alliance (published February 1888), which Italy joined in 1886. It entitled Bismarck to be called the 'Peace-maker' of Europe, a character he first acquired when, as 'honest broker' between Austria and Russia, he presided over the Berlin Congress in 1878. The phrase, 'man of blood and iron,' is based on 'the Iron Chancellor's' own use of the words in a speech in 1862.

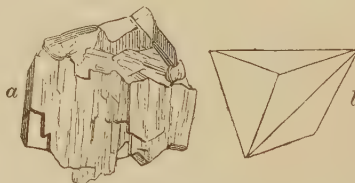
Bismarck's life was repeatedly threatened, and twice actually attempted—once at Berlin in 1866, just before the Bohemian campaign, by a crazy representative of popular dissatisfaction with Bismarck as champion of absolutism and fratricidal war; and again in 1874 at Kissingen, by an Ultramontane tinsmith named Kullmann. In 1885 Bismarck's 70th birthday was celebrated as a great national event. As a statesman he was imperious yet prudent, jealous, vindictive, and even unscrupulous—faults that sprang from his fervid patriotism; but in private life he could be genial, witty, and entertaining. He was tall and massive in person, fair and fresh of complexion, and quiet and cultured in manner. Though no orator, in public speeches he wielded the mother-tongue with trenchant vigour (see GERMANY); and he spoke French, Russian, and English with facility. Soon after the accession of William II., the relations between the veteran and his young master became strained. The emperor resented the chancellor's independent and masterful ways, and Bismarck felt driven to resign in March 1890, retiring with the title of Duke of Lauenburg. He now became, and—though there was a formal reconciliation in

1894—continued, a caustic and inconvenient critic of the emperor, the successive chancellors, and the new polity generally. In 1895 his birthday was again a national celebration, though the Reichstag refused to present an address of congratulation. Bismarck died 30th July 1898, and an autobiography was printed immediately after.

See books by Busch (1890-98), Blum (1884-95), Heyck (1904), and in English by Lowe (1888-96), Headlam (1899), Whitman (1902); his love-letters (trans. 1901), his political correspondence, and his speeches.—His son, Count Herbert Bismarck (1849-1904), was foreign secretary under his father.

Bismarck, FRIEDRICH, COUNT VON (1783-1860), born at Windheim in Westphalia, spent most of his life in the Württemberg army, but from 1804 to 1807 was in the English service. He wrote on cavalry tactics and organisation.

Bismuth (sym. Bi, eq. 208) is a brittle metal, white with a faint red tinge. It is found native in Cornwall, France, Peru, Siberia, &c., but is mostly obtained from Saxony. It exists also in combination with oxygen, carbonic acid, lead, tellurium, &c., but the native (impure) metal is preferred. The ore is placed in inclined iron tubes, and heat applied, when the metal melting and partly volatilising, runs down to the receivers, and when transferred to moulds, solidifies with a crystalline texture. When pure, it crystallises more readily than any other metal; and it exhibits the singular anomaly, that when it has been exposed to great pressure its



Bismuth:

a, example of native bismuth from Redruth, in Cornwall;
b, crystal of bismuth.

density becomes less. It may be distilled at a high temperature, and repels a magnet more than any other metal. Heated in the air, it burns with a blue flame, forming yellow fumes of oxide. Bismuth unites readily with other metals, forming Alloys (q.v.). The most remarkable of these is called fusible metal, consisting of 2 of bismuth, 1 of lead, and 1 of tin, the melting-point of which is 200.75° F. (93.75° C.), or 12° below the boiling-point of water. Spoons made of this alloy, therefore, readily melt when placed in boiling water; a favourite trick with amateur conjurers. A still more fusible metal is obtained by the addition of mercury, and this is used in forming moulds for toilet-soaps or in taking casts. Bismuth has a specific gravity of 9.83, and melts at 507° F. (264° C.).

Bismuth forms several compounds of service in the arts and in medicine; it combines with oxygen to form several oxides, of which the trioxide, Bi₂O₃, is the most important. It may be prepared by boiling together a solution of the subnitrate of bismuth, BiONO₃, and caustic soda, NaHO, when the oxide, in combination with water, is thrown down, and nitrate of soda remains in solution. It is employed in the porcelain manufacture as an agent for fixing the gilding, and for increasing the fusibility of fluxes, at the same time neutralising the colours which are often communicated by them. The ternitrate of bismuth is prepared by acting upon the metal bismuth with a mixture of one part of commercial nitric acid and

one part of water, and applying heat. The subnitrate or basic nitrate of bismuth receives the names of *Pearl White*, *Pearl Powder*, *Blanc de Fard*, and *Blanc d'Espagne*. It is used as a cosmetic, but is apt to become gray in tint, and even brown or black, when sulphuretted hydrogen, often evolved from sewers, cesspools, and drains, comes in contact with it. The subnitrate and subcarbonate of bismuth are used in medicine as very soothing, feebly astringent sedatives when applied to irritated mucous membranes, and are of great value in various forms of stomacach disease; while externally they are used as an application to scrofulous sores. The citrate of bismuth in combination with ammonia being very soluble, is more rapid and irritant in its action than the soluble salts last mentioned, but is of special use in cases of relaxation with excessive discharge. Bismuth salts sometimes contain arsenic, and must be used with caution. The 'bismuth breath' is a peculiar garlicky odour often felt in the breath of those who have taken bismuth preparations for some time. The cause of this is not clearly known, although at various times the presence of arsenic or tellurium as impurities has been blamed for it; but it would seem that it may be produced even when these are absent.

Bison (Lat.; Old High Ger. *Wisund*), a genus of wild cattle, represented by two rapidly disappearing species in Europe and America. The European Bison (*Bos europæus* or *Bonassus*), wrongly confounded with the Aurochs (*Urus*), was common in Europe in Roman times, but has gradually been all but exterminated. It only persists in a dwindling herd in the wilds of the Ural and Caucasus; the last in Lithuania was shot in 1919. The bison measures about 10 feet in length, stands about 6 feet high, and is extremely strong, especially in its fore-parts. Old bulls can knock down trees 5 or 6 inches in diameter, and can readily cope with wolf or bear. The most striking differences between a bison and an ox are the hump just behind the neck, the broader convex forehead, the longer limbs, the shaggier head and shoulders. There are also internal differences, such as the presence of an additional rib. The hump is due to the long spines of the backbone bodies in that region, and to the enormous muscles working the head. The horns are short and very far apart, a little curved inwards at the point, and fixed not at the ends of the top-most ridge of the head, but considerably in front of it. The long shaggy hair on head and breast is of a dusky brown colour, and is cast in summer. The females are not so large as the males, nor do they exhibit the same shagginess of the fore-parts. The bison is the largest quadruped now existing in Europe, although within the historic period there existed along with it an even larger ox (*B. primigenius*), the *Urus* of the ancients, abundant in the time of the early Roman emperors. The ancient *Bonassus* was apparently the still extant bison. The food of the bison consists of grass and brushwood, and the leaves and bark of young trees. Its cry is peculiar, 'resembling a groan or a grunt, more than the lowing of an ox.' It does not attain its full stature till after its sixth year, and lives for about thirty or forty years. The period of gestation appears to be the same as that of the ox. The bison has never been reduced to subjection by man, and the domestication even of individuals taken young, has been very partial. It generally shows a great aversion to the domestic ox. The bison is generally very shy, and can only be approached from the leeward, its smell being very acute. It is easily provoked, and is not approached without danger. It runs very swiftly, although it cannot long continue its flight, galloping with its head very low, so that the

hoofs are raised higher than the head. Few authorities derive any of the domestic breeds of cattle from the bison, but this theory has been recently proposed by Wilckens. It is usually supposed, however, that all have descended from *B. primigenius*.

There is no historical record that the bison ever existed in Britain; but remains of this, or of a very closely allied species, are found in pliocene freshwater beds in several parts of England, as well as on the continent of Europe. The most abundant fossil species is *B. priscus*, but other closely related forms are also known (*B. sivalensis*, *latifrons*, *antiquus*).

The American Bison (*B. Americanus*) is interesting as the only living species of the ox family indigenous to America, except the Musk Ox (q.v.) of the subarctic regions. It is commonly called *Buffalo* by the Anglo-Americans, but must be distinguished from the true Buffalo (q.v.). The bison was within recent times very abundant in America, especially in the prairies beyond the Mississippi, and from 63° N. lat. to New Mexico. Even in the 19th century it was still found in Ohio. Now it is nearly extinct—a result of hard winters, cattle-ranching, railways, and immigration. In 1886 the Smithsonian Institute sent out emissaries to procure a few skins and skeletons. On inquiry it was found none were left save in the Yellowstone Park, and a few in Montana and in Texas.



American Bison.

In 1850 there may have been 20,000, in 1910 perhaps 2000—mainly in the two U.S. reserves (Yellowstone and Montana), two Canadian reserves, and in some three or four private herds; in 1920, 6000 in Canada (including a newly discovered herd of 1000 in the Mackenzie basin), and 3400 in U.S. They used to congregate in large herds, and when migrating travelled in solid columns of thousands and tens of thousands, which could hardly turn or arrest their progress for the pressure of the masses from behind on those in front. The Indians shot them in the chase, frightened them over precipices, and in other ways killed them in enormous numbers.

The differences between the American and European bison are quite immaterial. The former is slightly smaller, shorter in limb, and blunter in horn. The fore-parts are still more shaggy, and retain most of their shagginess in summer. In their palmy days at least, the male and female American bison lived apart in separate herds, and the bulls, though usually pacific, were dangerous at the breeding or fighting time. The grizzly bear is said to be the only animal which could dare singly to attack a bison.

The economic importance of the bison was once great. The flesh, like coarse-grained beef, is tender and juicy, while the tongue and marrow bones and hump were specially prized. The hump formed pemmican; the fat, tallow; the skins, clothing or tent and canoe covers; the hair, cloth; and the dried droppings, fuel. The 'cattalo' (a cross with domestic cattle) is bred for beef and 'robe.'

See Allen's monograph on American bisons (1876), Hornaday's *Extirmination of the American Bison* (1889), Roosevelt and Grinnell's *Big Game Hunting* (1893), E. Thompson Seton's *Life-histories of Northern Animals* (1910); and for the European bison, Prince Demidoff's *Hunting Trips in the Caucasus* (1898).

Bissa'gos Islands, a group of small volcanic islands, about 30 in all, off the west coast of Africa, opposite the mouth of the Geba River, and belonging to Portuguese Guinea. The climate is pestilential to Europeans.

Bissão, an island and Portuguese station closer to the African coast than the Bissagos.

Bissen, WILHEM, a Danish sculptor, was born in Sleswick in 1798, and from 1823 to 1833 studied in Rome under Thorwaldsen, who, in his will, commissioned him to complete his unfinished works. In 1850 he was made director of the Academy of Arts, Copenhagen, where he died 10th March 1868. Among his masterpieces are the 'Valkyrie,' 'Cupid sharpening his Arrow,' and 'Moses'; his 'Orestes,' and a frieze 134 feet long, perished in the burning of the Christiansborg at Copenhagen (1884).—See the life by Plon (2d ed. Paris, 1871).

Bistort (*Polygonum bistorta*), a perennial plant, 1 to 1½ feet high, with a simple stem, ovate subcordate and wavy leaves, the radical leaves tapering into a long footstalk, and one dense terminal cylindrical spiked raceme of flesh-coloured flowers. The root is about the thickness of the little finger, blackish-brown externally, reddish within, and tortuous (whence the name bistort, and probably also the other popular name of Snake-root). The whole



Bistort (*Polygonum bistorta*):

a, b, c, flowering stem and root stock; d, a flower; e, a fruit.
(From Bentley & Trimen.)

plant is astringent, containing much tannin; the root is one of the strongest vegetable astringents, and was formerly much employed in medicine, both internally and externally, in hemorrhages and many other complaints. Bistort is a native of meadows in Europe, and is found in Britain, but is by no means common. In times of famine the root has been used after washing as a source of starchy food. See POLYGONUM.

Bistre is a pigment of a warm brown colour, prepared from soot, especially the soot of beechwood.

Bistrița, or BISTRITZ, a town of Transylvania, beautifully situated on the Bistritza River, 50 miles N.E. of Klausenburg; pop. 10,000.

Bisutun. See BEHISTUN.

Bit. See BRIDLE.

Bitche (Ger. *Bitsch*), a town of Lorraine, in a wild and wooded pass of the Vosges, 49 miles NNW. of Strasburg by rail. Its citadel crowns a precipitous and isolated rock in the middle of the town. The Prussians under the Duke of Brunswick attempted to surprise it in 1793, but failed. It resisted the Germans for seven weeks in 1815, and did not surrender till three weeks after the close of the war of 1870-71.

Bithur, a town in India on the Ganges, 12 miles NW. of Cawnpore. It is particularly devoted to the worship of Brahma, who is believed to have celebrated the completion of creation by a horse-sacrifice here. The stronghold of the infamous Nana Sahib, it was captured by Havelock in 1857.

Bithynia, an ancient division of Asia Minor, separated from Europe by the Propontis (Sea of Marmora) and the Bosphorus, and bounded N. by the Euxine. It contained the famous Greek cities or colonies of Chalcedon and Heraclea; and at later periods, Nicomedia, Nicæa, and Prusa were flourishing cities of Bithynia. The Bithynians were supposed to be of Thracian origin. The country was subdued by the Lydians, and afterwards became a part of the Persian dominion under Cyrus. But during the decline of the Persian empire, it became an independent kingdom under a dynasty of native princes, who made Nicomedia their capital. The last king, Nicomedes III., made the Romans his heirs, and with a large addition from the Pontic kingdom, Bithynia became a province of the empire (74 B.C.). Under Trajan, Bithynia was governed by Pliny the Younger. The Emperor Diocletian made Nicomedia his habitual residence. In 1298 Osman the Turk broke into the country; and in 1326 Prusa, or Brusa, then the chief town of Bithynia, became the capital of the kingdom of the Osmanli.

Bitlis, a town of Armenia, 120 miles SE. of Erzerum, 5470 feet above the sea, in a deep ravine traversed by the river Bitlis, one of the head-streams of the Tigris. Bitlis is a straggling, irregular place, covering a large surface of ground, and surrounded by bare limestone mountains, rising 2000 feet above the valley, which is filled with orchards and gardens, and watered by numerous streams and springs. The population numbers about 40,000, mostly Mohammedans. The Persians defeated Solymán the Magnificent near Bitlis in 1554. The Russians took it in 1915 and 1916.

Bitolia, or BITOLJ. See MONASTIR.

Bitonto (ancient *Butuntum*), a town of Italy, 10 miles WSW. of Bari. It is situated in a fruitful plain about 5 miles from the sea, is well built, and has a fine cathedral and a theatre. In the vicinity the Spaniards defeated the Austrians in 1734. Pop. 35,000.

Bittenfeld. See HERWARTH.

Bitter Apple. See COLOCYNTH.

Bitter Cress. See CRESS.

Bitter King (*Soulamea amara*), a shrub or small tree of the natural order Simarubaceæ (see QUASSIA), a native of the Moluccas and Fiji Islands, which has received its name from its intense bitterness.

Bittern (*Botaurus*), a genus of birds nearly related to the herons (Ardea). Bitterns are chiefly distinguished from herons by the long, loose plumage on the front and sides of the shorter neck, and by the greater length of their toes, the middle one being as long as the shank. The feathers can be erected so as greatly to increase the apparent size of the bird. The back of the neck is downy or almost bare.

They are almost all solitary birds, inhabiting reedy and marshy places, where they lie hid during the day, and will almost allow themselves to be trodden upon before they take wing. They feed during the night, and then often rise to a great height in the air, making the night noisy with loud resounding cries. Their food consists chiefly of frogs, and partly, also, of fish, lizards, water-insects, &c., and even of small birds and quadrupeds. The claw of the middle toe is serrated on the inner edge, probably to aid in securing slippery prey. The Common Bittern (*B. stellaris*) is distributed very widely over the Old World, being found in almost



The Common Bittern.

all, at least of the temperate, parts of Europe, Asia, and Africa, which are sufficiently marshy for its manner of life. It is now rare in Britain, owing to drainage; but was formerly more common, and in the days of falconry, was carefully protected on account of the sport which it afforded. Its flesh also was in high esteem, not being rank and fishy, like that of the herons generally. In size it is rather less than the common heron; the sharp bill is about 4 inches long, the feathers on the crown of the head are greenish black, and the plumage in general of a dull yellow colour, beautifully and irregularly marked and mottled with black and reddish brown.

The bittern makes a rude nest of sticks, reeds, &c. in its marshy haunts, and lays four or five greenish-brown eggs. It has a peculiar bellowing or booming cry, especially insistent at the breeding-season. This has earned for it such English provincial names as Mire-drum, Bull of the Bog, &c., and many of its appellations in other languages, perhaps even its name Bittern (*Bitour*, *Botur*, *Botaurus*). Some naturalists used to assert that the booming cry of the bittern was produced by the bird inserting its bill into a reed; that notion, however, has long since been exploded. The animal is sluggish, and its flight is neither swift nor long sustained. When assailed, it fights desperately with bill and claws; and it is dangerous to approach it incautiously when wounded, as it strikes with its long sharp bill, if possible, at the eye.—The Little Bittern (*B. minutus*) is common in some parts of Europe, but rare in Britain. Its whole length is only about 13 inches. The American Bittern (*B. lentiginosus*), a species almost equal in size to the common bittern, and very similar to it in habits and voice, has occasionally been shot as a straggler in Britain. It is common in many parts of North

America, migrating northward and southward, according to the season. The crown of the head is reddish brown, and the colours and markings of the plumage differ considerably from those of the common bittern. The Least Bittern (*B. exilis*) is another North American species, of very small size, which is also migratory, and somewhat social in its habits. The Australian Bittern (*B. australis*) is generally diffused throughout Australia, wherever marshes or sedgy rivers occur. In habits it closely resembles the bittern of Europe. The head and upper parts generally are purplish brown, except the wings, which are buff, conspicuously freckled with brown; the throat, breast, and belly mottled brown and buff.

Bittern. BITTER LIQUID, or SALT OIL, is an oily liquid obtained during the preparation of common Salt (q.v.). When the mother-liquor of the evaporating pans ceases to deposit crystals of common salt, there is left behind in the boilers the material called bittern. It consists principally of a strong solution of common salt, along with the chlorides of magnesium and calcium, to which the bitter taste is due; but it also contains the bromides of sodium and calcium, which are valuable sources of the element Bromine (q.v.). The bittern obtained from the salt-works at Epsom was at one time the source of the sulphate of magnesium (hence called Epsom salts), but at present this salt is obtained in other ways.

Bitter Root Mountains. See ROCKY MOUNTAINS.

Bitters are prepared from an infusion of herbs containing bitter principles. Formerly the name was limited to a favourite household remedy prepared from the Garden Angelica (see ANGELICA). The roots or seeds, or both, were placed in water, and allowed to simmer for several days, when the bitter infusion was strained off for use. Coincident with the disuse of these bitters, the term assumed a wider significance, embracing all bitter infusions, many of them containing a large element of alcohol, with distinctive names such as Angostura, Quassia, Gentian, or Orange Bitters. An aerated beverage, called tonic bitters, flavoured with chiretta, calumba, quassia, or gentian, is esteemed by many. The medicinal properties of bitters are mainly those of a mild tonic and pungent aromatic stimulant, and hence they are serviceable as a stomachic in cases of weakness of the digestive organs. When taken in excess, the more powerful of them are apt to do more harm than good, the tone of the stomach being undermined by the excessive stimulation. The most widely used bitter is that of the hop, to which, in part at least, are due the tonic properties of beer. The medicines known as hop bitters must not, however, be supposed to derive any virtues they possess from the hop, their nature being rather that of a purgative.

Bittersweet, or WOODY NIGHTSHADE (*Solanum dulcamara*), a plant found in hedges and thickets in Britain, and throughout the palaearctic region, also introduced into North America. The root is perennial and creeping; the annual stems climbing and trailing, 4 to 6 feet in length; the leaves acuminate with 2 lateral pinnae, the upper halbert-shaped; the flowers purple, in drooping corymbs, much resembling those of its congener, the potato, but much smaller, followed by ovate red berries of tempting appearance, which, although by no means approaching in poisonousness to those of the true nightshade (see BELLADONNA), contain an apparently variable quantity of alkaloid, and seem sometimes to have been the cause of accidents, particularly to children; although some physiologists have administered it without bad

effects. The twigs, collected in autumn after the leaves are fallen, are still occasionally used in medicine, a decoction being given in rheumatic or



Bittersweet (*Solanum dulcamara*):
a, a flower; b, fruit.

cutaneous affections. It is in the stems rather than in the fruit that the peculiar succession of tastes, to which the plant owes its name, is best observed.

Bitter Vetch. See OROBUS.

Bitterwood, a name given to certain species of *Xylopia*, a genus of Anonaceæ, trees and shrubs remarkable for the bitterness of their wood, particularly the West Indian *X. glabra*. Furniture made of this wood is safe from the attacks of insects. —The fruit of some of the species, particularly *X. sericea*, is highly aromatic and pungent like pepper. *X. sericea* is a large tree, a native of Brazil; its bark tissue is used for making cordage, which is excellent.

Bitterwood is also the name of *Picroëna excelsa* (formerly *Quassia excelsa*), a tree of the natural order Simarubaceæ (q.v.), a native of Jamaica, the wood of which is now alone used in medicine, as *Quassia* (q.v.), owing to the scarcity of the *Quassia amara*, to which the name was first given. It is, botanically, very nearly allied to the true quassia, and possesses very similar properties, containing the crystallisable bitter principle called Quassite or Quassin. The wood, which is intensely bitter, is a very useful stomachic and tonic; an infusion of it is a well-known and useful fly-poison; and it appears to act as a powerful narcotic on many quadrupeds.

Bitu'men, a mineral substance, remarkable for its inflammability and its strong peculiar odour; generally, however, supposed to be of vegetable origin. The name, which was in use among the ancient Romans, is variously employed, sometimes to include a number of the substances called Mineral Resins (see RESINS), particularly the liquid mineral substances called Naphtha (q.v.) and Petroleum (q.v.) or Mineral Oil, and the solid ones called Mineral Pitch, Asphalt (q.v.), Mineral Caoutchouc, &c.; sometimes in a more restricted sense it is applied by mineralogists only to some of these, and by some mineralogists to the solid, by others to the liquid ones. All these substances are, however, closely allied to each other. Naphtha and petroleum consist essentially of carbon and hydrogen alone, 84 to 88 per cent. being carbon; the others contain also a little oxygen, which is particularly the case in asphalt, the degree of their

solidity appearing to depend upon the proportion of oxygen which they contain, which amounts in some specimens of asphalt to 10 per cent. Asphalt also contains a little nitrogen. It seldom occurs quite pure, but is usually mixed with sand or other inorganic ingredients. Not infrequently it is found impregnating sandstone, limestone, shales, clay-slates, &c., as at Val de Travers in Switzerland, at Limmer in Hanover, at Lobsann in Alsatia, &c. Such is the character of the so-called fetid sandstones and limestones. From certain shales, marls, and slates, mineral oil is distilled in large quantities (see SHALE and MARL). Asphalt occurs plentifully on the shores and floating on the surface of the Dead Sea. It is met with in mass in many other places, as in Trinidad, in Venezuela (see BERMUDEZ, LAKE), at Los Angeles in California, Avlona (Valona) in Albania, &c. Now and again it occurs also, in small quantities, in mineral veins or lodes, where it is often mistaken for anthracite.

Closely related to asphalt are the pitch-like minerals called Grahamite and Albertite, which occur in fissures in the Carboniferous system of North America. The latter mineral has likewise been met with in Scotland. Some authorities also include the well-known Boghead Coal (q.v.) under the general head of Bitumen.

One of the most interesting of the bituminous minerals is Elaterite, known also as Mineral Caoutchouc or Elastic Bitumen. It is a very rare mineral, occurring in only a few localities—the Odin lead-mine in Derbyshire; a coal-mine at Montrelais, near Angers; a coal-mine near South Bury, Mass.; and at Newhaven, Conn. It is elastic and flexible like caoutchouc, and may be used, like it, for effacing pencil-marks. It is easily cut with a knife. Its colour is blackish, reddish, or yellowish-brown; and its specific gravity is sometimes a little less, and sometimes a little more than that of water. It has a strong bituminous odour, and burns with a sooty flame, its composition being CH_2 . Several substances occur in nature with a similar composition. Of these the best known is the mineral called Ozokerite. It is brownish, yellowish, or greenish in colour, streaked or spotted, and occurs in rudely fibrous masses, as at Slanik and Boryslaw in Galicia. It dissolves with difficulty in alcohol and ether. Various other natural products have been described as Ozokerite, to which they closely approach in chemical composition, and from which they seem to differ chiefly in their ready solubility in ether.

Bitzius, ALBERT, better known under the *nom de guerre* of Jeremias Gotthelf, a popular Swiss author, bepraised by Ruskin, was born at Murten, in the canton of Freiburg, 4th October 1797. He studied theology at Bern, and became in 1832 pastor of Lützelflüh, in Emmenthal, which office he retained till his death, 22d October 1854. A monument was reared to him in 1887. Bitzius has assured himself lasting popularity by his masterly delineations of Swiss popular life. His stories are characterised by rare simplicity and truth, lightened by delicate humour and graceful fancy. The best and most popular of his stories are *Käthi, die Grossmutter* (1847); *Uli, der Knecht* (1841), and its continuation, *Uli, der Pachter* (1849); and *Erzählungen und Bilder aus dem Volksleben der Schweiz* (5 vols. 1852-55). In his later years he wrote several pamphlets against the German democrats, without, however, violating those popular sympathies and liberal convictions which pervade his writings, and which at an earlier period led him vehemently to oppose the Bernese aristocracy.

Editions of his works appeared in 1856-57 and in 1894-96, the latter with a Life by Vetter; and there are Lives by Brockhaus (1876) and Bartels (1902). See R.

Huch, *Jeremias Gotthelfs Weltanschauung* (1919). Ruskin edited a translation of *Ulric the Farm Servant* (1888).

Bivalves form a class of shelled animals or molluscs in which the shell consists of two limy plates or valves, lying one on each side of the body. Mussel, oyster, cockle, and clam are very familiar examples. Compared with the other two great classes of Molluscs—the snails (Gasteropods) and the cuttle-fish (Cephalopods)—the bivalves are markedly quiet and passive. The great majority live a sessile life except during their youngest stages. With this inactivity certain characters are directly associated, of which the most marked are: (1) the undeveloped structure of the head; (2) the absence of head eyes; (3) the absence of biting or prehensile organs; (4) the marked development of large plate-like gills producing nutritive as well as respiratory currents; and (5) the presence of thick limy shells which exhibit most manifold variations within comparatively narrow limits.

History and Nomenclature.—Aristotle included bivalves among other shelled forms of very diverse structure in his great group of hard-skinned animals or Ostracodermata. Linnaeus was content to refer them to an equally heterogeneous group of worms. Cuvier defined them more exactly as a subdivision of molluscs, and gave them the title of headless (Acephala), which they still frequently receive. To Owen is due the designation Lamellibranchiata, which refers to the plate-like character of their gills, and it is by this title that they are now generally known. The term Lipocephala is a yet more modern one referring to the undeveloped nature of the head, and the absence of the rasping tongue which is found in other molluscs (Glossophora). Bivalve shells are exhibited by other animals besides Lamellibranchs, and especially by the small class of lamp-shells or Brachiopods, but in the latter the structure of the animal is not in any sense that of a mollusc, and the position of the valves is ventral and dorsal, instead of lateral. The Brachiopods are therefore excluded from this article, in which the title bivalve is regarded as equivalent to Lamellibranch.

Structure.—(a) The body of the bivalve can usually be split along the middle line into similar halves; it is bilaterally symmetrical. It is usually compressed from side to side, the breadth or thickness being small in proportion to the other dimensions. (b) The ventral surface of the animal—i.e. where the valves gape, is usually produced into a very characteristic ploughshare-shaped

the bivalve is effected. (c) From the middle line of the back—i.e. from the hinge of the shell—a flap of skin falls down each side of the body, covering the animal entirely with a double cloak, and closely adhering to the valves of the shell. These two *mantle-skirts* meet one another by their free margins on the ventral side when the shell is shut, but are of course separated when the foot is protruded through the gaping aperture. They are in the closest connection with the shell, which they in fact produce. The shell is an organic growth, and consists of three layers: (a) soft and cuticular, (b) prismatic, and (c) mother-of-pearl. The growth takes place on the internal surface, and at the margin of the mantle. The concentric lines and the modifications of colour remain as indices of the rhythm of growth. In many forms the mantle is drawn out into a pair of lips forming a double tube or siphon. Through this the water, circulated by the gills, passes in and out. Many forms lie buried in the mud with the open ends of the siphons protruded. In Pecten, Lima, and others, the margin of the mantle bears numerous tentacle-like processes. (d) Between each mantle-skirt and the side of the body proper, lie the large and prominent *gills*, which are covered with ciliated cells, causing currents of water which not only purify the blood spread out upon the plates, but whip minute food-particles to the inconspicuous mouth. They are indeed more nutritive than respiratory. (e) There is seldom any marked difference between the head and tail end of the animal; in the middle line in front lies the *mouth*, and the food-canal ends in a similar position behind. The canal itself lies mainly in the plane dividing the body into halves, but exhibits more or less looping in the region of the foot. A large gland (the so-called liver) is situated far forward near the stomach expansion. Still further forward, in the region of the pharynx, there often is a blind pocket containing a curious clear cylinder (the crystalline style), which some regard as the equivalent of the rasper found in other molluscs. Flat tentacles occur on each side of the mouth and look like small gills. They are richly supplied with blood-vessels and nerves. (f) The shell is opened by the action of a passive tendinous band (*ligament*) which lies at the dorsal meeting-place of the two valves, and acts like a piece of india-rubber squeezed into the hinge-line of a closed door; the shell is shut by one or two great muscles (*adductors*) which run across from valve to valve. There are also muscles, more or less powerful according to habit, for working the foot. The marks made by the insertion of the muscles on the shell are readily seen inside the empty valves. (g) The *nervous system* consists of three chief pairs of ganglia, the anterior cerebral pair being united by connectives to a pair in the foot (*pedal*), and to a posterior pair called *parieto-splanchnic* or *visceral*. From these three centres numerous nerves are given off to the body generally. An auditory sac (*otocyst*) is found in close association with the pedal ganglia, and a

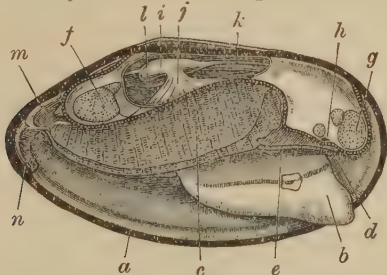


Fig. 1.—Longitudinal Section through a Fresh-water Mussel (after Marshall & Hurst, *Practical Zoology*):
a, edge of mantle; b, foot, with position of ganglion indicated; c, gills; d, mouth; e, tentacles or palps; f, posterior adductor muscle; g, anterior adductor; h, head-ganglion; i, ventricle of heart; j, auricle of heart; k, rectum; l, kidney; m, exhalant aperture; n, inhalant aperture.

muscular organ called the *foot*, which is used in boring and in locomotion, but tends to degenerate in the forms which are most inactive. From a gland frequently present in the posterior part of the foot, a viscid secretion is exuded in the form of threads (*byssus*) by which the attachment of

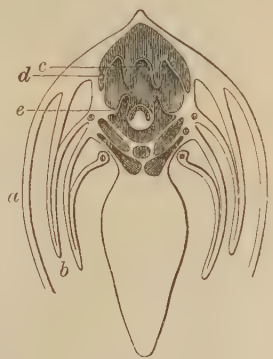


Fig. 2.—Vertical Section through a Fresh-water Mussel:

a, mantle; b, filaments of gills; c, ventricle of heart; d, auricle of heart; e, gut grown round by ventricle.

From these three centres numerous nerves are given off to the body generally. An auditory sac (*otocyst*) is found in close association with the pedal ganglia, and a

patch of smelling or water-testing cells (*osphradium*) occurs at the base of the gills. Though eyes are never present on the reduced head, they sometimes occur in extraordinary abundance (to the number of many hundreds) along the margin of the mantle (e.g. *Pecten*, *Arca*). (*h*) The heart lies just below the hinge, and consists of a contractile median ventricle driving the blood to the body, and of two auricles symmetrically placed on each side, receiving purified blood from the gills. The ventricle usually grows round the gut, which thus appears to run right through the heart. The whole organ is inclosed in a special portion of the body-cavity known as the pericardium, and this is in indirect communication with the exterior by means of two (*i*) *kidney-tubes* (nephridia) which lie below the heart, and open externally on the sides of the body. (*j*) A pair of *reproductive organs* lie in the foot, and their ducts open laterally near the apertures of the kidneys, with which they are occasionally united. The sexes are generally separate, but may be united, and both those forms may occur within one genus (e.g. oyster).

Habit.—The majority of bivalves are marine forms, but not a few occur in fresh water. Between the rapidly swimming *Lima* and *Pecten*, and the entirely quiescent oyster, intermediate degrees of activity and passivity occur, but most decidedly incline towards the extreme illustrated by the oyster. In *Lima* and *Pecten* the valves are opened and shut with great rapidity, and swimming thus effected; in the razor-shell (*Solen*) water is forcibly squirted outwards from within the mantle-cavity, and the animal moves backwards; in the cockle (*Cardium*) the foot is vigorous enough to enable the mollusc to take small jumps; in many cases (*Teredo*, *Pholas*, *Lithodomus*, *Xylophaga*)

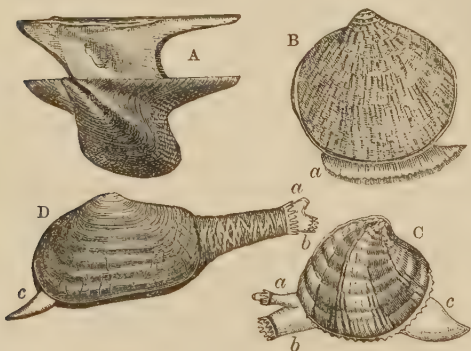


Fig. 3.—Several Forms of Bivalves:

A, *Avicula*; B, *Pectunculus*, with extended foot (*a*); C, *Venus*, with respiratory siphons (*a*, *b*) and extended foot (*c*); D, *Mya truncata*, showing respiratory siphons (*a*, *b*) and foot (*c*).

a permanent hole is bored in wood or stone; in the majority the foot is used for a slow creeping progression along the sand. From the nature of the nutrition, by the inwasting currents produced by the gills, it is evident that the food must consist of minute organisms. Algæ, Diatoms, Infusorians, minute Crustacea, and the like form the principal diet.

Life-history.—In almost all cases the eggs are fertilised within the mantle-cavity. There they remain for some time sheltered in the gills, or even within special brood-chambers (*Cyclas*). In rare cases (*Galeomma*, *Kellia*) the larvæ issue as such from the genital apertures, but in the vast majority the eggs are developed as above noted within the mantle-cavity. The larvæ very generally enjoy a period of free-swimming life before

settling down, but in some cases even this seems to be suppressed. In the Fresh-water Mussel (q.v.) (*Anodonta*) the larvæ are not liberated by the mother except in the presence of certain fishes such as sticklebacks. On the gills of the latter the larvæ become temporarily parasitic, and undergo very considerable metamorphosis.

Classification.—The Lamellibranchiata are usually classified according to the development of the closing muscles of the shell.

ORDER I.—*Isomya*. Anterior and posterior adductors approximately equal:

Sub-order I.—*Integripallia*, where the line attaching the lower margin of the mantle to the valve is a continuous curve and not inflected—e.g. *Arca*, *Trigonia*, *Unio*, *Anodon*, *Lucina*, *Astarte*, *Tridacna*, *Chama*, *Cardium*, *Cyclas*, *Cyprina*.

Sub-order II.—*Sinupallia*, where the line attaching the lower margin of the mantle to the valve is not a continuous curve, but inflected to form a sinus—e.g. *Tapes*, *Venus*, *Tellina*, *Mactra*, *Mya*, *Saxicava*, *Aspergillum*, *Pholas*, *Teredo*.

ORDER II.—*Heteromya*. Anterior adductor decidedly smaller than posterior—e.g. *Mytilus*, *Modiola*, *Lithodomus*, *Mulleria*.

ORDER III.—*Monomya*. No anterior adductor, and no siphons—e.g. *Cardiola*, *Avicula*, *Ostrea*, *Lima*, *Pecten*.

Distribution.—Bivalves are found all over the world, though only a few species like *Mytilus edulis* and *Saxicava arctica* can be described as cosmopolitan. The marine forms occur from the shore level down to great depths, and the same species is not unfrequently found at the most diverse depths. Historically, the bivalves appear in the Cambrian strata, though only to a slight extent. In the Lower Silurian they are still far from numerous, but Barrande enumerates 1100 species from the Upper Silurian of Bohemia alone. The *Heteromya* at first preponderate. From the Upper Silurian onwards, bivalves are exceedingly abundant, and the satisfactory preservation of their shells makes them of great value as index fossils in determining the age of given strata. Among Lamellibranchs occur some of the best instances of types persisting throughout long periods.

Pedigree.—The bivalves must be regarded as a group which has developed along a line entirely different from that of the other molluscs. From an ideal ancestral mollusc like that sketched by Ray Lankester, two lines of progress have been followed. On the one hand, the shell has remained single, the head has not been reduced, the buccal apparatus has developed, and the life has been relatively active. This path has been followed by Gasteropods, Pteropods, and Cephalopods. On the other hand, along the other line, the mantle has become bilobed, the shell double, the gills large, plate-like, and nutritive, the head much reduced, and the life relatively passive. This path has been followed by the Lamellibranchs.

Economic Importance.—Many bivalves (oyster, mussel, cockle, clam, &c.) are used for food. Others are largely utilised as bait in sea-fishing. Pearls and mother-of-pearl are obtained from *Meleagrina* and other forms. The valves of *Placuna* are sometimes used for window-panes. *Venus mercenaria* and other types have been used by savage tribes for coinage. Larger shells are occasionally calcined for lime. The boring bivalves have an important destructive influence on piers and ship timber, but ensheathing in metal renders their attack less effectual. See CONCHOLOGY, MOLLUSCS, OYSTER, &c.; Huxley's *Anatomy of Invertebrated Animals* (1877); Ray Lankester's *Natural History* (1906).

Bivouac (through Fr. from Ger. *beiwache*: *bei*, 'near,' and *wachen*, 'to watch') is the encampment of soldiers in the open air, without tents, where

every one remains dressed in his place, and with his weapons by him. It used to be held necessary for opposing armies thus to pass the night before a battle. The French revolutionary armies first introduced the practice of dispensing with tents throughout the campaign, thus greatly lessening their baggage-trains and increasing the celerity of their movements. A European army carries tents only for reserves and hospitals. In populous country full use is made of buildings for all troops not in or very near the firing-line (see BILLETING, CAMP). Troops not thus accommodated bivouac. Each battalion, or other unit, has its allotted space, in the centre of which the arms are piled in quarter column. Round the piles of arms each company has its sleeping-ground marked out. A bivouac would, if possible, be placed under the shelter of trees, or so as to be protected from wind by hedges. Improvised screens of straw, heather, &c. would be used, and large fires lighted. But the health of troops always suffers if bivouacked constantly in bad weather. In India and other hot countries it is found necessary to carry tents still, and the bivouac is never resorted to if it can be avoided.

Bixa. See ANNATTO.

Bizerta, or BENZERTA, a fortified seaport of Tunis, at the head of a bay of the Mediterranean, and at the mouth of a lagoon, united to the bay by a narrow channel. It is the most northerly town in Africa, being 38 miles NW. of Tunis. Its port, formerly one of the best in the Mediterranean, has again been deepened, provided with a dry-dock (1905), and made a great French naval station. The tunny, mullet, and coral fisheries are very productive. Pop. about 20,000.—The ancient *Hippo Diarrhytus* or *Zoritus*. Bizerta was founded by the Tyrians, was fortified by Agathocles in 307 B.C., and under the Romans was a free city. Since 1881 it has been held by the French.

Bizet, GEORGES, a French composer, was born 25th October 1838 at Paris, and studied at the Conservatoire under Halévy, and in Italy. His earlier operas, *Les Pêcheurs de Perles* (1863), *La Jolie Fille de Perth* (1867), showed Wagnerian sympathies and had little success; but his music to Daudet's *L'Arlésienne* was popular, and his comic opera *Carmen* (1875) was not more remarkable for its originality and dramatic effectiveness than for its success. He had just begun to taste the sweets of popularity when on 3d June 1875 he died. See *Lives* by Pigot (1889) and Bellaigue (1891).

Bjala, a Polish town, 38 miles SE. of Siedlee; pop. 13,000.

Björneborg, or PORI, a port of Finland, on the Kokemäen River, 60 miles NNW. of Åbo, exporting timber, tar, and fish; pop. 20,000.

Björnson, BJÖRNSTJERNE, a celebrated Norwegian writer, was born 8th December 1832, at Kvikne, in Österdalen, where his father was pastor. After studying at the university of Christiania from 1852, and then for a year at Copenhagen, he returned to Norway in 1857, and published his beautiful tale *Synnöve Solbakken*, which at once attracted universal attention, and is still regarded as having marked an epoch in the recent literature of Norway. Immediately afterwards he was appointed manager of the Bergen Theatre by its proprietor Ole Bull, and in 1858 he published the tale *Arne* and the drama *Halte-Hulda*. In 1859 he left Bergen to be editor of the newspaper *Aftenbladet* at Christiania, but his stay there was cut short by the violent controversies in which he soon became involved; and in consequence he withdrew the next year to Copenhagen, where he collected a number of his shorter tales, and

brought them out, together with the drama *Mellem Slagene*, under the title of *Smaastykker*. From 1860 to 1862 he lived in Rome, where he wrote several lyrical poems, the drama *Kong Sverre* (1861), and the trilogy *Sigurd Slembe* (1862); and on his return to Norway in 1863 the Storting awarded him a yearly pension. In the next two years he produced two plays, *Marie Stuart in Skotland* and *De Nygifte*, for the theatre at Christiania, of which he was director from 1865 to 1867, at the same time editing a paper. In 1872-76 he again lived abroad. He was a powerful political orator, and took an active part in the movement which led to the victory of parliamentary government in Norway. Though he lived in Paris in 1883-88, he was still a leader of the 'Peasants' Party,' and at home and abroad he was a somewhat narrowly patriotic anti-Swede as well as democrat; but he protested against the artificial introduction of a patriotic Norwegian language as distinct from the customary Dano-Norwegian. Many of his plays are polemical or satirical—amongst these *The King*, *Leonarda*, and *The New System*; *A Gauntlet* (1883) was a skilful problem play; *A Bankruptcy* (1875) pleased better on the stage; *Beyond Human Power*, in two parts, is mystical, symbolical, religious. Of his many novels the most famous were *Flags are Flying* (1884; trans. as *The Heritage of the Kurts*) and *The Paths of God* (1889; trans. as *In God's Way*). *Mother's Hands* and *Absalom's Hair* were striking short stories. *Geography and Love*, *Paul Lange*, and *Laboremus* were later plays. He died 26th April 1910.

Most of the plays and novels have been translated, some of them two or three times over; *Synnöve Solbakken* was translated by Mary Howitt as early as 1854. See Brandes, Björnson and Ibsen, and his *Main Currents* (1905); the essay by Gosse in the series of translations edited by him (1892-97); Tissot, *Le Drame Norvégien* (1893).

Björnstjerna, MAGNUS, COUNT, a Swedish Liberal statesman, born in 1779, in 1813 fought at Leipzig, and in 1814 he concluded the treaty that united Norway with Sweden. In 1828-46 he was ambassador to Britain. He died in 1847.

Blaas, KARL VON (1815-94), painter, born at Nauders in Tyrol, studied at Innsbruck and in Italy, was professor at Vienna and Venice. He painted many frescoes besides portraits and other works, and wrote an autobiography.

Blacader, ROBERT, bishop of Aberdeen and of Glasgow, and first archbishop (1492) of Glasgow, is said to have died in 1508 on a pilgrimage to Jerusalem.

Black may be considered as the negation of colour, resulting from the absorption of the rays of light by certain substances. Painters produce it approximately by an unequal combination of red, blue, and yellow (see COLOUR; also DYEING). In medieval art, black was symbolical of evil, error, and woe; and is still a usual funereal colour (see FUNERAL RITES). For its use in Heraldry, see HERALDRY, HATCHMENT.

BLACK PIGMENTS, used in painting, are derived principally from animal and vegetable substances. The most important are: *Lamp-black*.—The finer kinds are prepared from the soot of burnt resin or resinous woods. The coarser varieties are made from the soot of an oil obtained from gas-tar and other cheap bodies. This black is much used by painters, and it is also employed for making printing ink.—*Blue-black* consists of levigated charcoal from vine twigs. It is also a very serviceable black for artistic work.—*Bone-black* and *Ivory-black*, as their names imply, are simply animal charcoal, and consequently possess the power of absorbing colour from animal and vegetable solutions. Therefore they cannot be safely mixed with other organic

colours in water-colour painting. The above pigments are, of course, prepared either with oil or gum, according as they are to be used in oil or water-colour work.—*Indian Ink* (q.v.) is a black prepared from a vegetable carbon, and so far resembles lamp-black, but it is not very suitable for mixing with other colours. For black dyes, see DYEING.

Black, ADAM, publisher, was born in Edinburgh, 20th February 1784, and, trained as a bookseller there and for two years in London, he, with a nephew established the Edinburgh business of Adam and Charles Black. The two enterprises which, above all else, gave position, fortune, and success to the firm, were the purchase of the copyright of the *Encyclopædia Britannica* in 1827 after Constable's failure; and that of Scott's novels from Cadell's representatives in 1851 for £27,000. A seventh and eighth edition of the *Britannica* was issued during Black's business connection with the firm, while Scott's novels had a large and steady sale. Black was long a prominent and useful citizen of Edinburgh; was twice Lord Provost; and was Liberal M.P. for Edinburgh (1856–65). He died 24th January 1874. A statue was erected in Edinburgh in recognition of his services in 1877. See *Memoirs* by Nicolson (1885).

Black, JOHN, journalist, was born near Duns, Berwickshire, in 1783. Left an orphan ere he had reached his twelfth year, Black, after filling posts in the offices of a Duns writer and an Edinburgh accountant, in 1810 went up to London, and was engaged as a parliamentary reporter for the *Morning Chronicle*, of which from 1817 he assumed the editorship. Under him the paper was celebrated for its independence and fearless advocacy of progress—a fearlessness which led to his duel with Roebuck in 1835. Charles Dickens was one of his reporters and contributors, and James Mill helped him with almost daily advice. John Stuart Mill has described him as 'the first journalist who carried criticism and the spirit of reform into the details of English institutions.' He retired from the editorship in 1843; an annuity of £150 a year was bought for him by his friends; and, until his death on 15th June 1855, he lived in a pleasant cottage at Snodland, near Maidstone. Black was author of a *Life of Tasso* (1810), and the translator of works from the German, French, and Italian.

Black, JOSEPH, an eminent chemist, was born in 1728, at Bordeaux, where his father was engaged in the wine-trade. Both his parents were of Scotch descent, but natives of Belfast, to which city their son was sent for his education in 1740. In 1746 he entered the university of Glasgow, and studied chemistry under Dr Cullen. In 1751 he went to Edinburgh to complete his medical course, and in 1754 took his degree. In his famous graduation thesis (1756) he showed that the causticity of lime and the alkalies is due to the absence of the carbonic acid present in limestone and in what are now called the carbonates of the alkalies. To this he gave the name 'fixed air,' which gave way before that of 'carbonic acid,' first used by Lavoisier in 1784. The book was a distinct contribution to chemical science, and by Brougham and Robison is placed second only to Newton's *Optics* as a model for scientific investigation. Black pointed out the path afterwards followed by Cavendish, Priestley, and Lavoisier. On the removal of Cullen in 1756 to Edinburgh, Black succeeded him as professor of Anatomy and Chemistry in Glasgow, but soon after exchanged duties with the professor of the Institutes of Medicine, and lectured on the subject for ten years, practising the while as a busy physician, yet finding time for original investigation.

Between 1756 and 1761 he evolved that theory of 'latent heat' on which his scientific fame chiefly rests, and which formed the immediate preliminary to the next great stride in discovery by his pupil and assistant, James Watt. In 1766 he succeeded Cullen in the chair of Medicine and Chemistry in Edinburgh, and henceforward he devoted himself chiefly to the elaboration of his lectures, in which he aimed at the utmost degree of perspicuity, and with perfect success. His class became one of the most popular in the university; it occasioned, however, some disappointment that one so capable of enlarging its territory made no further contributions to chemistry. Though of an extremely delicate constitution, he prolonged his life, by care and temperance, till 6th December 1799. His lectures were edited by Professor Robison (1803). See his *Life and Letters* by Sir William Ramsay (1918).

Black, WILLIAM, novelist, was born in 1841 in Glasgow, where he received his education, and studied art at a government school with the view of becoming a landscape-painter. Instead, however, he adopted journalism, having written for the *Glasgow Weekly Citizen* prior to his removal to London in 1864. During the Prusso-Austrian war of 1866 he was employed as special war correspondent on the staff of the *Morning Star*; and in a novel, *Love or Marriage* (1868), he utilised some of his experiences. In *Silk Attire* (1869) and *Kilmeny* (1870) proved more successful than the previous work; but it was *A Daughter of Heth* (1871) that established his reputation with the novel-reading public. *The Strange Adventures of a Phaeton* (1872) is founded on an actual driving excursion between London and Edinburgh. *A Princess of Thule* (1873) is the best perhaps of all his many romances, with its vivid transcripts of Hebridean scenery, its quaint Gaelic-English, above all, its exquisite heroine. Among its successors are: *Three Feathers* (1875); *Madcap Violet* (1876); *Green Pastures and Piccadilly* (1877); *Macleod of Dare* (1878); *White Wings* (1880); *Sunrise, a Story of these Times* (1880); *Shandon Bells* (1882); *Yolande* (1883); *Judith Shakespeare* (1884), with Shakespeare himself for one of the characters; *White Heather* (1886); *Sabina Zembra* (1887); *In Far Lochaber and The Strange Adventures of a House Boat* (1888); *The Penance of John Logan* (1889); *New Prince Fortunatus* (1890); *Stand Fast, Craig Royston* (1890); *Wolfenberg* (1892); *Handsome Humes* (1893); *Highland Cousins* (1894); *Briseis* (1896); *Wild Eelin* (1898). Assistant-editor for five years of the *Daily News*, Mr Black in 1874 abandoned journalism. He died 10th December 1898.

Black Acts are a collection of the acts of the Scottish parliament from 1424 to 1594, printed in Black-letter (q.v.); the hated anti-Presbyterian acts of the Scottish parliament of 1584; also the English act of 1723 concerning poachers who disguised their faces in black for the purpose of committing outrages.

Black Art. See MAGIC.

Black Assize, the popular name commemorative of an extraordinary and fatal pestilence which broke out at Oxford at the close of the assizes, July 6, 1577. It was popularly interpreted as a divine judgment on the cruelty of a sentence passed by the court. From the 6th of July to the 12th of August, 300 persons in Oxford and the neighbourhood are said to have died of this terrible malady, among whom were the chief officials who sat on the assize, most of the jury, and many members of the university. Women, poor people, physicians, visitors, and children are said to have escaped the infection. A similar event is recorded as having taken place at Cambridge at the Lent Assizes in 1521.

Black-band Ironstone is an ore of iron which has been extensively worked in Scotland and elsewhere. It occurs in the Carboniferous system in regular bands or layers, and is generally associated with coal and limestone. It is mainly a carbonate of iron with much coaly matter. The black-band ironstone is easily reduced. It does not, however, yield a first-class iron when smelted by itself, and is therefore generally mixed with a small quantity of hematite, which communicates strength and hardness to the iron obtained.

Black Beer. See SPRUCE BEER.

Black Beetle, at once a popular and a scientific term—popular when applied widely to all sorts of forms, from Blaps (q.v.) to the Cockroach (q.v.), which is not a beetle at all; scientific when restricted to a great family of beetles known as Melanosomata in the Heteromorous sub-order of Coleoptera. The possible extent of the term will be evident when it is noted that even when restricted to these Melanosomata, it may be applied to 600 genera and about 4500 species. These Melanosomata (Gr., 'black-bodied') have short strong upper jaws, the eyes to the sides, the feelers usually with 11 joints, the uppermost joints of the legs almost always separate (the anterior pair spherical and sunk in sockets, the posterior lying transversely), the wing-covers often fused, and in these cases without wings, the abdomen with five free joints. They love dark damp places, though a few less dismally coloured, for the prevalent black is sometimes relieved, get out into the open. They mostly have a bad smell. The larvæ are very long and narrow. The familiar Blaps, the Bolitophagus of fungus, the very abundant Hypophloeus, living under the bark of old trees, the Tenebrio, with its larva the *Meal-worm*, so much used in feeding birds, are some of the commonest genera of Melanosomata or black beetles.

Blackberry. See BRAMBLE.

Blackbird, or MERLE (*Turdus merula* or *Merula vulgaris*), a well-known species of Thrush (q.v.), common in all parts of Britain, and throughout Europe generally; found also in the north of Africa, and in the Azores. In Asia, it gives place to a closely allied species, *Turdus pecilopterus*. In size, the blackbird is intermediate between the

evergreens or shrubs; and when disturbed, takes wing with a vociferous chattering of alarm, seeking refuge in some neighbouring thicket. Its food consists of worms, snails, insects, berries, seeds, &c. Its fondness for fruit makes it often annoying to the gardener; but probably it would in general be better to protect cherries and pears by nets than to shoot the bird, which is of great use as a destroyer of insect larvæ. Like some of the other thrushes, it also devours (especially in winter) great numbers of small snails, dexterously breaking the shell against a stone. When searching for food, it jumps about with characteristic alacrity; when disturbed, it flies off with a somewhat magpie-like chuckle; its familiar flight along the hedges is 'wavering and fitful,' and in the breeding-season the female especially moves by a succession of starts. It is not usually a gregarious bird, although great flocks sometimes appear upon British coasts in winter, arriving from more northern lands; and probably at that time the blackbirds with us in summer go south. It pairs very early in spring; the male and female are indeed very often seen together during winter; it builds its nest early, and generally has two broods in the year. The nest is usually placed in some thick bush; it is of ruder workmanship than that of the song-thrush, which, however, it resembles, and is usually formed of strong stems of grass, with a finer lining of dry grass inside, and a massive plastering of clay outside. The inside and outside of the nest are kept very clean, and a male has been seen to remove the dropping of a young bird from the vicinity of the nest. The male aids in the work of feeding the young. The eggs are four or five in number, of a pale blue colour, generally speckled with brown. A female blackbird and a male thrush have been known to pair. The voice of the blackbird is very powerful, and its song more mellow than that of the thrush, but with 'much less variety, compass, or execution.' The blackbird is often kept as a cage-bird, and would be much more frequently so, but for the too great loudness of its song; it is readily trained, exhibits considerable powers of imitation, and has even been taught to articulate.—The Ring Ouzel (q.v.), sometimes called the Ring Blackbird, is a nearly related species (*T. torquatus*).—The Crow, the Redwing, and other blackbirds of America are entirely different.—The Savanna Blackbird of the West Indies is also of a different family. See CROTOPHAGA.

Black Book, an interesting collection of English Admiralty Law in the 14th century, first edited by Sir Travers Twiss (4 vols. 1871-76). It indicates the pretensions of the civil law as regards trial without jury, torture, &c., which afterwards led to legislation in vindication of the position of the Common Law courts.—BLACK BOOK is also a usual term for the reports presented to parliament in 1536, on which the legislation for the dissolution of the monasteries and the secularising of their revenues proceeded. These reports probably never existed as a book (fabled to have been burnt in Queen Mary's reign); such of them as remain are to a large extent extravagant and malicious accusations without any evidence (see *Letters and Papers of the Reign of Henry VIII.*, edited by James Gairdner, vol. x. 1888; Cardinal Gasquet, *Henry VIII. and the English Monasteries* (2 vols. 1888-89).—A list of habitual criminals, first published in 1877, has been also so called.

Black-boy. See GRASS-TREE.

Black-bryony. See BRYONY.

Black-buck, the common Indian antelope (*Antilope cervicapra*). See ANTELOPES.



Blackbird.

missel-thrush and the song-thrush or mavis. The plumage of the adult male is wholly of a deep black colour, the bill and orbits of the eyes yellow; the female and the young are dark brown above, paler on the throat, and rusty brown on the breast, with brown bill, yellow, however, in spring-time. Very old blackbirds have the feathers on the back of the neck tipped with fine hairs. White, cream-coloured, and other variations occasionally occur. The blackbird frequents hedges, thickets, and woods; is shy, restless, and vigilant, keeping much under cover of

Black-bully, or **BALLY-TREE WOOD**. See CHEWING-GUM, SAPODILLA PLUM; and for another Black-bully, see BULLET-TREE.

Blackburn, a town of Lancashire, 21 miles NNW. of Manchester, and 9 E. of Preston. It stands on a stream from which it appears to derive its name, a branch of the Ribble. The surrounding district, formerly known as *Blackburnshire*, or *Blagbornshire*, was long very wild and dreary, but now is densely populous. Coal was formerly plentiful, and lime still abounds in it. Blackburn had acquired some importance as a market-town in the 16th century. Its manufacturing prosperity can be traced back at least to the middle of the 17th century, when it was noted for the production of a kind of linsey-woolsey known by the name of *Blackburn Checks*, afterwards superseded by the *Blackburn Grays*, so called from their being printed unbleached. In the course of the 18th century the cotton manufacture became the chief industry of the town, which is now a great centre of manufacture, the cotton-factories being numerous and large, many of them employing from 1000 to 2000 operatives. The iron trade is important, and machine-making employs many hands. Great improvements in machinery for the cotton manufacture have been made in Blackburn, among which the first place in importance as well as in date must be assigned to the invention of the spinning-jenny by James Hargreaves (q.v.), a native of the town, in 1767. His invention, however, was regarded with so much dislike that he was compelled to remove from the town, and it was not till the 19th century that it came into general use. The growing importance of Blackburn is seen in the increase of its population from 36,629 in 1831 to 63,126 in 1861, 104,014 in 1881, and 133,052 in the extended area of 1911; the 1921 census (126,630) was taken during a holiday season. The chief public buildings are the town-hall (1856), an Italian edifice; the Gothic exchange (1865); the infirmary (1862); and St Mary's Church, of very ancient foundation, but almost entirely rebuilt (1826-57). There is a corporation park of 50 acres, part of which is 700 feet above sea-level, and commands a wide view; a Queen's Park of 35 acres was opened on Jubilee day, 1887. The grammar-school was established by Queen Elizabeth in 1567. There is a technical school. Blackburn has returned two members since 1832; it received its municipal charter in 1851, and became a county borough in 1888.

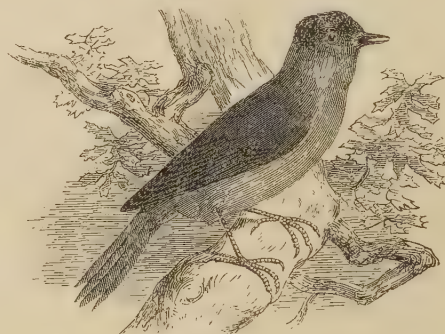
Blackburne, FRANCIS, Lord Chancellor of Ireland, was born at Great Footstown, County Meath, 11th November 1782, and in 1798 entered Trinity College, Dublin. Called to the English bar in 1805, to the Irish in 1822, he was appointed Attorney-general for Ireland in 1830 and again in 1841, Master of the Rolls in 1842, Chief-justice of the Queen's Bench in 1846, and Lord Chancellor of Ireland in 1852 and 1866. He thus served under both Whig and Tory governments, and was brought into close connection with the leading politicians on either side; whilst at different times he had the duties imposed on him of prosecuting O'Connell, and judging Smith O'Brien. In 1867 he declined an offer of a baronetcy, and for some years he was Vice-chancellor of Dublin University. He died 17th September 1867. See the Life by his son (1874).

Black Canons. See AUGUSTINIANS.

Black Cap, the cap worn by English judges as a part of full dress, and so put on by them when a prisoner is condemned to death.

Blackcap, **BLACKCAP WARBLER**, or **BLACKCAP FAUVETTE** (*Sylvia atricapilla*), a bird of the great family of the Sylviadæ, or Warblers. It is regarded as the sweetest song-bird in Britain, or

indeed in Europe, except the nightingale, to which it is said to be even superior in 'its shake or trilling note.' Very often, however, the strain is desultory, and of short continuance; but it is loud, rich in tone, and has a 'great variety of sweet and gentle modulations.' The song is especially joyous during and after rain. White says, in his *Natural History of Selborne*, that while the Blackcap warbles, its throat is wonderfully distended. It is a rather smaller bird than the nightingale; the female is larger than the male. The general colour is gray,



Blackcap (*Sylvia atricapilla*).

with an olive tinge above, and becoming white below. The upper part of the head in the male is jet-black; in the female, of a rusty-brown colour. The feathers of the head, both in the male and female, are somewhat erected, giving the bird a hooded appearance, on account of which it is called, in Germany, 'the monk.' In Britain, the Blackcap is only a bird of passage, arriving early in spring, and retiring in September. It is most frequent in the southern counties of England, but is found even in Scotland; on the Continent, it extends its migrations as far north as Lapland. In the south of Europe, it is found both in summer and winter, and especially frequents bushy places. Its beautiful song, sometimes spoilt by successful mimicking, and its lively affectionate habits, make it a favourite captive. See WARBLER.

Blackcap Titmouse, or **CHICKADEE**, a North American bird. The Marsh Titmouse, a British bird, is sometimes called Blackcap, or Blackcap Titmouse. See CHICKADEE and TITMOUSE.

Black Chalk. See CHALK, BLACK.

Blackcock, **HEATH-FOWL**, or **BLACK GROUSE** (*Tetrao tetrix*), a species of Grouse (q.v.), abundant in Britain wherever there are moors of considerable extent, and more particularly where there are bogs and morasses with rank herbage, or, adjacent to the moors, natural woods or young plantations of pine and fir. Comparatively rare in the south of England, the blackcock becomes more common towards the north, and is very plentiful in the mountainous parts of Scotland. It is found in some of the Hebrides, but not in the Orkney or Shetland Isles. The only other British species, the Capercailzie (q.v.) or Wood-grouse, became some time ago virtually extinct in Britain, but the noble bird has now been reinstated. On the continent of Europe it occurs both in mountainous and marshy countries, as on the Alps and in Holland; it is found as far south as the Apennines, and as far north as the forests of Lapland; it abounds in most parts of Scandinavia, where it is carefully protected, the males only being killed, but these in great numbers for the London market; it is diffused over almost all parts of Russia, and is found in Siberia. Its range is restricted to the

Eurasian continent. The male is much larger than the female, sometimes weighing as much as 4 lb., while the female weighs only about 2 lb. They also differ very much in plumage. The male is of a shining bluish-black colour, with a conspicuous white bar on the wings below the ends of the great wing-coverts, and a mixture of black and white on the legs; there is a piece of bare scarlet skin above the eye; the outer feathers on either side of the tail are elongated and curve outwards, giving it a very peculiar appearance. The female, called the *Gray Hen*, is of a rusty-brown colour, darkest on the



Blackcock (Male and Female).

upper parts, everywhere barred and mottled with a darker colour; the tail is straight and only slightly forked at the end. The young males resemble the females in plumage. The shank in this species is feathered, but not the toes. The flight, though heavy, is strong and rapid, and the birds can also run with much agility. It is a gregarious bird, but in winter the sexes generally keep in separate flocks. In spring the males resort to elevated and open spots, where they crow, and also make a sound which has been likened to the whetting of a scythe, thus inviting the females to repair to them; they strut and trail their wings like turkey-cocks, and fierce contests often take place among them. They are polygamous, and pay no attention to the females during incubation, nor do they take any part in rearing the young. The nest is of the simplest construction, a few straws or the like, placed together among tall heath, or under the shelter of a low thick bush. The eggs, six to eight in number, are yellowish-white, speckled with orange-brown, and about 2 inches long. The usual food consists of the seeds of rushes and other plants, berries, insects, worms, the tender shoots of heath, leaves, &c. But the blackcock sometimes visits cornfields and stubbles to feed on corn, is frequently to be found in turnip-fields near plantations in hilly districts, and, at least in winter, eats the young shoots of pines, firs, birches, and alders. It is highly esteemed for the table. The shooting season is from 20th August to 10th December.

Hybrids between different species of grouse, and even between grouse and pheasant, are said to exist, but not much reliable information is available. Thus it is probable that the bird called *Tetrao hybridus* or *medius*, sometimes found in the Scandinavian peninsula and other parts of Europe, is a hybrid between the Black Grouse and the Capercaillie, *Tetrao urogallus* (q.v.). The Ptarmigan (q.v.) or Brown Grouse are nearly allied.

Black Death is one of the names given to a fearful epidemic which desolated the world from China to Ireland in the 14th century. It raged in England and the rest of Europe in 1348-49, again in 1361-62, and in 1369; and at the time was usually called in England the 'Pestilence' or the 'Great Pestilence.' It is now believed to have been a specially severe visitation of the oriental plague (see **PLAGUE**), with some special symptoms, mainly boils or buboes on the thighs and arms, and putrid inflammation of the lungs, with vomiting of blood. Its black spots (whence the name) and tumours were the seals of a doom that medicine had no power to avert. In most cases the victims died in two or three days, and sometimes the very day they were stricken.

The pestilence seems to have originated in China, and is said to have been preceded, if not, as was believed, in some measure caused, by strange convulsions of nature—earthquakes, droughts, famines, floods, and swarms of locusts; while its westward course was accompanied by dense and awful fogs, and an apparent inversion of the order of the seasons. There had been a visitation of the ordinary plague in 1342; but it was in 1348 that Europe was terrified by the approach of a wholly unparalleled scourge. In China 13,000,000 were reported to have perished, and 24,000,000 elsewhere in the East. By the northern coast of the Black Sea and Constantinople, the contagion reached the seaports of Italy and Southern France, whence Germany and England were infected. The first English victims succumbed in Dorsetshire in August 1348; but it was not till winter that it reached London by way of Gloucester and Oxford. The havoc was almost incredible, but is well attested. Towns were stripped of their inhabitants; religious houses lost nine-tenths of the inmates. In London 100,000 died, 50,000 being buried in a plot of ground now covered by Smithfield; and Norwich mourned 60,000 deaths. Careful investigators have come to the conclusion that the victims of this one visitation must have comprised one-third if not one-half of the total population of England, which is estimated to have then been from 3,000,000 to 5,000,000 in all. For a time Scotland enjoyed immunity, and spoke of the 'foul death of the English;' but ere long, like Ireland, it was also severely visited.

The mortality caused by the plague was only one startling consequence. Religious excitement led to extravagances of fanaticism, especially in Germany, to that of the Flagellants (q.v.); all natural bonds of human society were loosened, so that friend deserted friend and mothers fled from their stricken children, and the demoralisation showed itself in many cases in reckless debauchery. Elsewhere perverted Christian zeal led to frightful persecutions of the Jews, as at Mayence, where 12,000 Hebrews were believed to have been massacred.

But it is only in modern times that the extent of the economic and social consequences of this plague has been fully understood; the black death forms a great economic turning-point in English history. The dearth of labourers caused wages in England to be nearly doubled; law after law was passed to prevent the inevitable rise in the payment of labour; and the ill-feeling thus engendered between landholder and tiller of the soil led to numerous social changes and the rebellion of Wat Tyler. Old methods of culture disappeared; farms on lease largely took the place of great estates managed by bailiffs.

The great pestilence is referred to by Chaucer and Langland; Boccaccio's *Decameron* gives a singularly vivid view of its ravages in Florence;

but see the article **PLAGUE**; Hecker's *Epidemics in the Middle Ages* (1843); Creighton's *History of Epidemics in Britain* (1892); Jessopp's *Coming of the Friars* (1888); works by Thorold Rogers, Cunningham, Denton (for the economic aspects), and (for subject as a whole) Cardinal Gasquet, *The Great Pestilence* (1894).

Black Draught. See **MAGNESIUM**, **SENNA**.

Black Earth (*Tchernozem* of Russian geologists) is the name given to a deposit which covers vast areas in South Russia, extending over the steppes and low-lying plateaus that border on the Black Sea, and the depressed area to the north of the Caspian, with a breadth from north to south of from 200 or 300 to nearly 700 miles. It closely resembles the Löss (q.v.) of Central Europe in texture and structure, for it is fine grained, and is usually devoid of stratification. It varies in colour, however, from dark brown to black, and in thickness from a foot or two up to 6 or 7 yards, occasionally reaching, it is said, even to 60 feet. It is composed chiefly of siliceous sand (about 70 per cent.), alumina and other ingredients (23 per cent.), and organic matter (about 7 per cent.). But the composition is variable, the organic matter sometimes exceeding 10 per cent. It bears the same relation to the glacial accumulations of Russia that the löss of the Rhine, the Danube, &c. does to those of central Europe, and is probably partly of aqueous, partly of wind-blown origin. According to some geologists, indeed, it is wholly due to the action of constant föhn winds, descending from the great ice-sheet which formerly covered much of northern Europe. As that ice-sheet retreated its morainic and fluvio-glacial accumulations were exposed, and, becoming desiccated, yielded much fine dust, which continued to be swept southward until, with the gradual disappearance of the ice-sheet, the föhn winds ceased.

Black Eye. See **BRUISE**.

Blackfeet Indians, a tribe of friendly Algonkians, generally Roman Catholic, now living in Montana and British America.

Black-fish (*Centrolophus pompilus*), a bony fish of the family Stromateidæ, in the division with spinous rays (*Acanthopterygii*). It is nearly allied to the beautiful *Coryphæna* (q.v.), so frequently called dolphins. Though found in the Mediterranean, on the western coasts of Europe, and occasionally on the southern coasts of Britain, it is everywhere rare, perhaps because it is an inhabitant chiefly of deep waters. It is known to attain a length of more than 30 inches, and a weight of 14 lb. The general form is not unlike that of a perch; there is a single elongated dorsal fin with short rays; the dentition is very feeble; the body is covered with minute scales; the skin is tough and can be stripped off like that of an eel; there is no air-bladder. The colour is black, that of the fins intensely so. It is remarkable for great strength and velocity, and as an article of food is described as delicious. Another British species (*C. britannicus*) is also recorded, and the genus *Stromateus* is closely allied. The name is locally given to various species of fish, and even to small whales and dolphins.

Black Flux is prepared by heating in a covered crucible ordinary or crude cream of tartar, the bitartrate of potash, $\text{KHC}_4\text{H}_4\text{O}_6$, when the tartaric acid, $\text{H}_2\text{C}_4\text{H}_4\text{O}_6$, is decomposed, and charred, forming carbonic acid, CO_2 , which remains in combination with the potash as carbonate of potash, K_2CO_3 , accompanied by much free carbon. This very intimate mixture of carbonate of potash and carbon, otherwise called black flux, is a fine black powder of great service in the fluxing of metallic ores, as of Lead (q.v.), and the separa-

tion of the metal therefrom. In the preparation of black flux it is usual to add to the cream of tartar half its weight of nitre, while *white flux* is produced when twice its weight of nitre is used. The black flux is likewise employed as the raw material from which, on the application of heat in iron vessels, the metal potassium can be obtained.

Black Forest (Ger. *Schwarzwald*), a wooded mountain-chain in Baden and Württemberg, running parallel with the course of the Rhine after its great bend near Basel, and often only a few miles distant from it. The Rhine also bounds it on the south, and the level country between the Enz and the confluence of the Neckar with the Rhine borders it on the north. The chief rivers rising in the Black Forest are the Danube, Neckar, Murg, Kinzig, Elz, Enz, and Wiessen. Of these, the valley of the Kinzig divides the southern and loftier portion from the northern district. The chain attains its greatest elevation in the bare and round-topped Feldberg (4903 feet high), above celebrated Höllenthal, a narrow valley known in connection with Moreau's retreat in 1796. The great mass called the Kaiserstuhl (Emperor's Chair), situated near Breisach, is quite isolated. As to the geological character of the mountains, primitive granite and gneiss form their core, porphyry occurs on their sides, and sandstone in the north and east. Silver, copper, cobalt, lead, and iron are found in greater or less quantity in the principal chain, which is luxuriantly wooded, its name Schwarzwald being derived from the dark-tinted foliage and immense number of its fir-trees. The district is also rich in mineral waters—e.g. the baths of Baden-Baden (q.v.) and Wildbad (q.v.). On the Rhine side the descent is precipitous, but towards the Danube and the Neckar it is gradual. Among its numerous valleys, the Murgthal is the most famous for its natural beauties; but, indeed, the whole of the country is here rich in picturesque scenery, gemmed with cascades and deep mountain-lakes, around which cluster the legends of many centuries. The climate is healthy, but severe, although the western slopes are studded with vineyards. Summer rye, oats, and potatoes are cultivated in some parts, but with difficulty, the rearing of cattle being attended with much greater success. This, and the manufacture of articles of wood, forms the chief industry of the inhabitants. The making of wooden clocks and other kinds of timepieces employs thousands of persons; and great numbers of articles of this kind, including musical boxes, are exported to all parts of the world. A railway starting from Pforzheim makes the complete circuit of the mountains, which are now crossed by a line from Offenburg to Singen, and by numerous shorter lines. The Black Forest railways have been difficult engineering enterprises. The line between Freiburg and Neustadt rises 2000 feet in 22 miles, and at some parts has rails on the rack system. See Seguin's *Black Forest, its People and Legends* (2d ed. 1886).

Black Friars. See **DOMINICANS**. The old Dominican monastery in London, dating from 1276, stood near the north end of Blackfriars Bridge.

Black Friday is a name given to the 11th May 1866, from a commercial panic then at its height, caused by the stoppage of Overend, Gurney, & Co., London.

Black Guard is a term used in the 16th century for the lowest menials of a noble house, the scullions who cleaned pots and pans. It was also used of the hangers-on of an army, camp-followers, then a rabble, vagabonds.

Black Gum. See **TUPELO**.

Black Hawk, a famous chief of the Sac and Fox Indians, born in 1767. He joined the British in 1812, and opposing the removal west of his tribe, fought against the United States in 1831-32. He died in 1838. There are *Lives by Patterson* (1834) and *Snelling*.

Blackhead, or COMEDO. See ACNE.

Blackheath, a high-lying open common in the metropolitan borough of Greenwich, to the south of Greenwich Park, 5 miles SE. of London. It commands a fine view, but is now not more than 70 acres in extent, many villas having encroached upon its margin. The Roman road to Dover crossed it. Blackheath was the first place in England where the ancient Scottish game of golf was introduced, most likely in 1608. On it stands Morden College, founded in 1695 by Sir John Morden for decayed Turkey merchants. Of schools innumerable, the chief is the Proprietary, established in 1830. Blackheath was formerly the scene of several insurrections, including those of Wat Tyler (1381), of Jack Cade (1450), and of the Cornishmen under Lord Audley (1497). Here, too, the Danes encamped in 1011; the Londoners welcomed Henry V. from Agincourt; and Charles II. on his way from Dover met the army of the Restoration. Blackheath was also a noted place for highwaymen. See Dr Drake's *History of Blackheath* (1886).

Black Hole, an appellation familiarly given to a dungeon or dark cell in a prison, and associated in the public mind with a horrible catastrophe in the history of British India—viz. the cruel confinement of a party of English in the military prison of Fort William, since called the 'Black Hole of Calcutta,' on the night of 19th June 1756. The garrison of the fort connected with the English factory at Calcutta having been captured by Suraja Dowlah (Siraj-ud-Daula), the nawab of Bengal, he caused the whole of the prisoners taken, 146 in number, to be confined in an apartment 18 feet square. This cell had only two small windows, and these were obstructed by a veranda. The crush of the unhappy sufferers was dreadful; and after a night of excruciating agony from crowding, heat, thirst, and want of air, there were in the morning only 23 survivors, the ghastliest forms ever seen on earth. But it should be remembered that Siraj had good reasons for attacking the English; and some of the best authorities hold that he was not aware of the condition and size of the prison. See, besides Holwell's narrative (1758) and Macaulay on Clive, *Old Fort William*, by C. R. Wilson (1906); *Bengal in 1756-57*, by S. C. Hill (1906).

Blackie, JOHN STUART, born in Glasgow in 1809, was educated at Aberdeen and Edinburgh, Göttingen and Berlin. In 1834 he published a metrical translation of Goethe's *Faust*, passed as advocate at the Edinburgh bar, and began to contribute to the magazines on German subjects. In 1841 he was appointed to the chair of Humanity in Marischal College, Aberdeen, which he held until 1852, when he was elected to the Greek chair in the university of Edinburgh. After he became professor he took an active part in promoting educational reform, and in the movement that led in 1859 to the remodelling of the Scottish universities. His incessant activity in lecturing and writing letters to the newspapers showed his marvellous vitality and the breadth of his sympathies. He always figured as the patriotic champion of Scottish nationality and its characteristic features, and advocated with equal ardour the preservation of things as dissimilar as old south-country customs and the Gaelic language. During the years 1874-76 he advocated throughout the country with great enthusiasm the found-

ation of a Celtic chair in Edinburgh University, and was successful in raising upwards of £12,000 for its endowment. He resigned his chair in 1882 to become a kind of peripatetic philosopher, expounding throughout Scotland alternately wit and wisdom, and the inalienable rights of the Highland crofter. He published a fine verse translation of *Æschylus* in 1850, another of the *Iliad* in ballad metre in 1866, as well as several volumes of verse. His prose works embrace moral and religious philosophy, the method of history, the land laws, and a short life of Burns (1888). His principal philological papers were collected in *Horæ Hellenicæ* (1874). He died 2d March 1895. See the *Life* by Miss Stoddart (1895), and the shorter sketch by his nephew (1896).

Blacking is the material employed for producing a black glazed shining surface on leather. The main ingredient in the various kinds of blacking is Bone-black (q.v.), which is mixed with an oil, some sugar, and a little sulphuric acid. The materials in Day & Martin's blacking are finely powdered bone-black ground with sperm-oil, raw sugar or molasses, a little vinegar, and some concentrated sulphuric acid (specific gravity 1.843). The substances are incorporated together one by one in the order in which they are stated, and the action of the sulphuric acid is to convert much of the lime in the bone-black into sulphate of lime, which causes a thickening of the mixture, and a tenacious paste results. This paste, diluted with weak vinegar, is put, whilst warm, in stoneware bottles, and is then ready for the market. For harness the blacking consists mainly of beeswax, softened with turpentine, and mixed with ivory-black, Prussian blue, and copal varnish.

Black Isle is the common name for the peninsula in Easter Ross, lying between the Beaully and Moray Firths and Cromarty Firth. See ROSS-SHIRE.

Black Lead (or BLACKLEAD), GRAPHITE, or PLUMBAGO, a mineral consisting chiefly of carbon, but containing also more or less of alumina, silica, lime, iron, &c., to the extent of 1 to 47 per cent., apparently mixed rather than chemically combined. Black lead is the popular name, and that by which it is generally known in the arts, though no lead enters into the composition of the mineral; graphite is that generally preferred by mineralogists. It sometimes occurs crystallised in flat hexagonal tables; but generally massive, and more or less radiated, foliated, scaly, or compact. It is of a grayish-black colour, with a somewhat metallic lustre, and a black and shining streak, and is perfectly opaque. It is greasy to the touch, and is a perfect conductor of electricity. It occurs in beds and masses, laminae or scales in the schistose rocks (gneiss, mica-schist, clay-slate, &c.), and is sometimes in such abundance as to give its name to the schist (graphite-schist) in which it appears. It occurs also now and again in fissures in granite, or in scattered scales in various other igneous rocks, as in syenite in Norway, in porphyry in the Harz, in the Laurentian rocks of Canada. Thick vein-like masses of black lead are met with in Siberia, Spain, Bavaria, Japan, Ceylon, Mexico, and half-a-dozen widely separated localities in the United States and elsewhere; the once extensive supplies of Borrowdale in Cumberland are now exhausted. It is far more incombustible than even anthracite (or *blind-coal*), burning with much difficulty even before the blowpipe, on which account it is much used for the manufacture of crucibles or 'melting-pots,' which withstand a great heat. These are not, however, made of mere black lead, but of black lead in powder, mixed with half its weight

of clay. Black lead is used for making pencils; to give a black gloss to iron grates, &c.; and to diminish the friction of belts, machinery, and cartridges. An artificial graphite is manufactured at Niagara Falls. See PENCILS.

Black Leg. See BLACK QUARTER.

Black Letter (*Black Letter*), the name which came into use about 1600, and is now commonly applied in this country to the types that on the Continent are most generally known as Gothic. The first printed books imitated every peculiarity of the contemporary manuscripts; and as printing was first practised in Germany and the Netherlands, the first types were copies of the letters in use in those countries in the middle of the 15th century. Two sorts of letters have been employed in the writings of Western Christendom. What have been called *Roman* letters prevailed from the 5th to about the close of the 12th century, when they gradually began to pass into what have been called *Gothic* letters, which continued till the 16th century, when, in most European countries, they were superseded by Roman letters. The first types, as has been said, were Gothic, and they spread with the art of printing into various European states. In France and Italy they were slightly modified by cutting off some of their rougher points; and when thus trimmed, they came to be known in the former country as *lettres de somme*, being so called, it is said, from their use in an edition of the *Summa* of St Thomas Aquinas. The classic taste of Italy could not long tolerate the Gothic character even of the *lettres de somme*; and they were still further modified, until they assumed the shape to which the name of Roman letters has since been given. The first works printed with these new types were two beautiful editions of Pliny's *Natural History*: the one by John of Spire at Venice in 1469; and the other by his disciple, Nicholas Jenson, also at Venice, in 1472. Another Venetian printer—the first Aldus Manutius—attempted in 1501 to supersede the Roman letters by what have been called *Aldine* (q.v.), or Venetian, but are best known as *Italic* characters. These can scarcely be said to have come into much more than temporary or exceptional use; but the Roman letters in no long time spread from Venice all over the west of Europe. Although thus supplanted in general use, the Gothic or black letter was long retained for special purposes, such as, in this country, the printing of Bibles, prayer-books, proclamations, and acts of parliament. Books in black letter being the earliest, are highly prized by antiquaries and bibliomaniacs, who are hence sometimes spoken of as 'black-letter devotees.' A form of the black letter still continues in general use in Germany; but about half of the books printed there are now in Roman letters. See PRINTING and TYPES. The 'Black-letter Saints' Days' of the Anglican calendar were printed in old calendars in black or ordinary letters, whereas the greater feasts were usually printed in red (hence Red-letter Days).

Black List, the name familiarly applied to printed lists connected with insolvency, bankruptcy, and other matters affecting the credit of firms and individuals, circulated for the private guidance of the mercantile community. The publication of such statements has frequently been made the ground of actions of damages in respect of injury done to financial credit. If, however, the statement is an accurate report of what took place in a court of law, it cannot be challenged as slanderous. On the other hand, any inaccuracy in the statement which injures a person's credit renders the publisher of the list liable in damages. The idea of furnishing to subscribers private lists of a more

searching kind is due to Mr Thomas Perry of Cornhill. In the United States the vast system of the mercantile agency and other similar institutions provides information of this kind; and printed lists of forgeries of bank-notes are issued. The term is also sometimes applied to persons convicted of habitual drunkenness. Under recent statutes provision is made for the intimation of such convictions to occupiers of licensed premises. It is a punishable offence for the persons so convicted to purchase, or attempt to purchase, intoxicating liquors in licensed premises within three years after the conviction, and licence-holders are also prohibited, under severe penalties, from knowingly supplying liquor to persons declared to be habitual drunkards. In the United States the term 'black-listing' is generally applied to the practice of an employer furnishing other employers with the names of employees discharged by him. In many states there are enactments prohibiting employers from thus blacklisting employees with the intent of preventing their employment by others; but these enactments do not, as a rule, prevent an employer from furnishing to another a truthful statement of the cause of an employee's discharge.

Blacklock, THOMAS, D.D., the blind poet, was born of humble parentage at Annan in 1721, and lost his sight through smallpox before he was six months old. After going through the necessary course of academic study in Edinburgh, he was licensed as a preacher of the Established Church in 1759, and in 1762 was ordained minister of Kirkcubright. The congregation objected strongly to the appointment, and in 1764 he resigned the charge in consideration of a small annuity. After this he took pupils to board with him in Edinburgh till his death on 7th July 1791. It was a letter of his that arrested Burns on the eve of his departure for the West Indies. The first volume of his own poor poems appeared in 1746; and a collected edition was published in 1793.

Blackmail, a rent or tribute formerly exacted by freebooting chiefs from the people in the Border counties of England and Scotland, and along the Highland border. It was a kind of compromise with robbers, and bought immunity from the attacks not only of others, but also of those to whom it was paid. It is mentioned in Archbishop Hamilton's *Catechisme* (1552) and in Maitland's *Thievis of Liddesdale* (about 1561), and it continued to be exacted along the Highland border until about the middle of the 18th century. The celebrated Rob Roy was about 1730 a notable levier of blackmail in the southern Highlands and adjacent Lowlands. Later, Coll M'Donell of Barrisdale was noted farther north. For 'blackmailing' by threatening letters, see THREATS.

Black Monday, Easter Monday, 14th April 1360, so called from the extraordinary darkness and the fatally bitter cold.

Black Monks. See BENEDICTINES.

Blackmore, SIR RICHARD, court physician to William III. and Queen Anne, is remembered as the most heavy and voluminous of poetasters. Born at Corsham in Wiltshire, he was educated at Westminster and Oxford, taking his B.A. in 1674. He was first a schoolmaster, then a London physician (1687-1722), and died at Boxted, Essex, in 1729. He seems to have been a good and well-meaning man, and the merciless ridicule of contemporary wits was due, in some part at least, to the moral and religious tone of his works, and to his free censures of the libertinism of the time. But the worthlessness of the poems has been amply confirmed by the judgment of posterity. *The Creation*, considered his best, Addison pronounces

'one of the most useful and noble productions in our English verse;' but few modern readers are likely to examine the grounds of this judgment, still less to agree with it. Blackmore wrote six epics in sixty books (choosing always the loftiest themes), besides versions of various books of the Bible, and theological, medical, and miscellaneous treatises.

Blackmore, RICHARD DODDRIDGE (1825-1900), novelist, was born at Longworth, Berkshire, and educated at Blundell's School (Tiverton), and Exeter College, Oxford. He graduated in 1847, afterwards studied law, was called to the bar at the Middle Temple in 1852, and practised for a time as a conveyancer. Ere long he united the pursuit of literature with the management of a market-garden and orchard at Teddington-on-Thames, and there he died 20th Jan. 1900. His first publications were *Poems by Melanter* (1854), *Epullia* (1855), *The Bugle of the Black Sea* (1855), followed by *The Fate of Franklin* (1860), and a translation of the first and second books of Virgil's *Georgics* (1862). Other volumes of verse have followed these, as well as a complete translation of the *Georgics* in 1871. His first novels were *Clara Vaughan* (1864) and *Cradock Nowell* (1866), but his first distinct success was *Lorna Doone, a Romance of Exmoor* (1869), which reached a 38th edition in 1893. *Lorna Doone* is almost a great novel. The plot is good and well developed; the style has the quaint and pleasing flavour of its age, the time of James II., with Sedgemoor for its point of highest interest; and the figures have much more life and movement than in any other of his novels. His plots are usually defective in construction, and the human interest in his books is a much weaker element than that rare insight into and sympathy with inanimate life in which he stands alone among English novelists. He has described for us with absolute truth the Devonshire farmer as he lives and speaks; and many of his women, if somewhat shadowy in outline, are yet figures of rare tenderness and grace. His other novels are: *The Maid of Sker* (1872), perhaps his second-best story; *Alice Lorraine* (1875); *Cripples the Carrier* (1876); *Erema* (1877); *Mary Anerley* (1880); *Christowell, a Dartmoor Tale* (1882); *Tommy Upmore* (1884); *Springhaven* (1887); *Perlycross* (1894); *Tales from the Telling House* (1896); and *Dariel* (1897).

Blackness, on the Firth of Forth, once the port of Linlithgow, is now a very small village, and its castle, once important and a state prison, is now an ammunition depot and oil-station.

Blackpool, a watering-place, parliamentary and county borough of Lancashire, on the Irish Sea, 18 miles WNW. of Preston. The population has risen from 1664 in 1851 to 58,371 in 1911, 99,640 in 1921 (holiday season). It is one of the most frequented watering-places in the west of England, the sands being excellent, the views delightful, and the climate bracing. There are two fine piers, one of them with a splendid pavilion; a promenade extended by the Princess Parade in 1910-12; winter-gardens, an aquarium, a free library, and theatres. A tower of the Eiffel style, 500 feet high, with shops and entertainment rooms at the base, was erected in 1893-95.

Black Prince, the popular title conferred upon Edward (1330-76), eldest son of Edward III. (q.v.), perhaps referred to the colour of his armour. He went with his father to the Cotentin in 1346, and helped in the taking of Caen. At Crecy, where he was nominally in command of a wing, his part has been described as spectacular, but he played it heroically and with brilliant success. On the renewal of the war in 1355 he was given the

command in Aquitaine, where he restored English prestige, but diminished the English leanings of the inhabitants. After a brilliant raid in the south, he made an unsuccessful attempt to co-operate with the English forces in the north, but found it necessary, at Tours, to race against the French for the gap of Poitiers or be cut off from his province. The two armies lost each other. At Poitiers. Edward found the French in possession, with, according to different estimates, three to seven times his numbers. But inferiority in tactics, an ill-judged combination of precipitancy and delay, and the refusal of the great lords to listen to good generals like Sir William Douglas turned what should have been an easy victory for the French into a crushing defeat, in which King John was taken. In 1361 the prince married his cousin Joan, the Fair Maid of Kent, widow of Sir Thomas Holland. In 1363 he returned to Aquitaine with the title of Prince of Aquitaine and Gascony. His expenditure there, always lavish, was increased by the Spanish campaign, in which he won the victory of Najera for the deposed Pedro the Cruel against his supplanter Henry de Trastamare and Du Guesclin. He taxed his subjects grievously to obtain the means of rewarding them richly. In particular the hearth tax (fouage) led to an appeal to the king of France, and in consequence to war. His province slipped gradually from his grasp, but before he retired to England, ruined in health and fortunes, he performed the last of his great achievements, the only one that certainly owed nothing to Sir John Chandos, the taking of Linnoges. He ordered that all the inhabitants should be put to the sword, but relented after a few thousands had been slain. His ill-health did not prevent him from embarking on the Thouars expedition, which never reached France, or championing the Good Parliament in its onslaught upon Alice Perrers a few weeks before his death. The prince was not only a model of chivalry, flawed with occasional ferocity, but as a tactician, strategist, and disciplinarian he has been placed above even Edward III., Du Guesclin, and Sir John Chandos. He was too much influenced by those immediately about him to be a good ruler, and his extravagant generosity and display kept him in trouble with creditors and taxpayers from his boyhood. See BADGE, ICH DIEN, and Life by Dunn-Pattison (1910).

Black-quarter, also known as Black-leg and Quarter-evil, is a contagious and infectious disease, due to the presence in the system of a specific micro-organism, the bacillus of black-quarter or *Bacillus chauvvei*, a small rod-shaped organism, aerobic and motile, which multiplies by sporulation. It is never found in the blood during life, but is plentiful in the tumours and effusions if examined soon after death. This disease is said to affect all ruminants, but is best known in cattle from a few months to two years old. It is less common than it was many years ago when it used to occur on some farms as an enzootic. This is thought to be due to better cultivation of the soil and improved farming.

Often the first thing observed is an animal standing apart with a dull depressed appearance and its back a little raised. When made to move it is found to be lame, and a hot painful swelling may be discovered about a thigh or quarter (hence the name quarter-evil) or elsewhere—if in the back or loins there will not be lameness, but a general stiffness. The temperature may be 105°, and there is generally constipation. The disease is practically uniformly fatal. After death the tumour is found to be almost black.

On farms where the disease was common the young stock were sometimes bled once, or even

twice, a year, and setons inserted in the dewlaps. Plenty of rock-salt should be within reach of the animals, and an occasional dose given of the sulphates of soda and magnesia with a little common salt and nitre. A vaccine, first prepared in France, from the tissue of the tumours is largely used on the Continent, and also in North and South America, perhaps more largely in the Argentine than anywhere, and there they have a firm belief in its efficacy. It can be obtained, and has been used, in Britain, but has not in all cases been an unqualified success.

Black Rod, GENTLEMAN-USHER OF THE, an officer of the House of Lords, appointed by letters-patent. He is chief gentleman-usher to the sovereign, and usher of the order of the Garter, at the chapter-meetings of which he keeps the door. He has charge of all arrangements for maintaining order in the House; takes into custody any peer guilty of breach of privilege; and (himself, or by his deputy the yeoman-usher) summons the House of Commons to the Peers when the royal assent is given to bills, or when royal speeches are read. If the sovereign is personally present in the Lords, he *commands*, but if royalty is represented by Lords Commissioners, he only *desires* the attendance of the Commons. The appointment of messengers, door-keepers, &c., rests with Black Rod. His title is derived from his wand, surmounted by a gold lion, which he carries instead of the mace.

Black Rod of Scotland. See HOLYROOD.

Black Sea, or **EUXINE** (the *Pontus Euxinus* of the ancients), is an inland sea lying between Europe and Asia, extending from 41° to 46° 38' N. lat., and from 27° 30' to 41° 50' E. long. Its greatest length from east to west, on the 42d parallel, is 720 miles; its greatest breadth, near the west end, 380 miles; and its area, exclusive of the Sea of Azov, is 163,711 sq. m., according to Strelbitsky. On the south-western extremity it communicates by the Bosphorus, the Sea of Marmora, and the Dardanelles, with the Mediterranean, and on the north-east by the Straits of Kertch, or Yenikale, with the Sea of Azov. The Black Sea drains nearly one-fourth of the surface of Europe, and also about 114,000 sq. m. of Asia. Throughout its whole extent it has but one island, and that a small one, lying opposite the mouths of the Danube, called *Adassi*, or Isle of Serpents, on which is a lighthouse. In the centre its depth ranges between 1000 and 1070 fathoms, and as there are no shoals along the shores, except at the entrance of the Bosphorus, the navigation of the sea ought to be particularly easy and safe. It is so in summer; but in winter, being inclosed on every side, it becomes the scene of conflicting winds, and of storms which, though of short duration, are terrible while they last.

All the coasts are high, with good harbours, except between the mouths of the Danube and the Crimea; there the land is low, and the danger of navigation greatly increased in winter by the presence of floating ice; for, from the many large rivers which flow into this sea and that of Azov (Danube, Dniester, Bug, Dnieper, Don, Kuban, and Rion, in Europe; and the Kizil-Irmak and Sakaria, in Asia), the waters are fresher, and consequently more easily frozen than those of the Mediterranean. The specific gravity of the water of the Black Sea is 1014 (fresh water being = 1000), while that of the Mediterranean is 1028. The shores from Odessa to the Crimea are ice-bound during January and February; and although the harbour of Odessa is never frozen up, yet the drift-ice frequently renders the entrance to it dangerous.

There is no tide in this sea, but the large rivers

flowing into it give rise to currents, which are particularly strong in spring when the snows melt. There is a strong flow out through the Bosphorus.

The most important ports on the Black Sea are Constantza, Sulina, Odessa, Nikolaiev, Kherson, Eupatoria, Kertch, Sebastopol, Poti, Batum, Trebizond, Samsun, Sinope, and Varna.

The depth of the water is unfavourable to the extensive establishment of fisheries, but sturgeon are caught in the Straits of Yenikale, and other fish are abundant.

The ancients believed that the Euxine was at one time much more extensive, and that it had no connection with the Mediterranean, until the Thracian Bosphorus had been burst through by an earthquake, or by the great deluge known as the Deucalion deluge, which inundated Greece.

The sea has been navigated from a very early period. Its original Greek name was *Axeinos*, or 'inhospitable' sea, afterwards changed euphemistically to *Euxeinós*, the 'hospitable.' In the time of Xerxes large quantities of corn were exported from its ports to Athens and the Peloponnesus. The Romans and Byzantines, and also the Genoese, had large traffic on the sea. From the fall of Constantinople (1453), all but Turkish vessels were excluded from its waters, until the treaty of Kainardji (1774), when the Russians obtained the right to trade in it. Ten years after, Austrian ships were privileged to trade here; and by the Peace of Amiens in 1802 British and French ships were admitted. It was entered by the allied fleets, at the requisition of the Porte, in January 1854, and a dreadful storm in November of the same year caused great loss of life, shipping, and stores. By the Treaty of Paris (1856) it was opened to the commerce of all nations, and closed to ships of war, while the erection of arsenals was forbidden; but this article was repudiated by Russia in 1870, and in the following March, at a conference in London, the neutralisation of the sea was abrogated. Russia and Turkey thenceforward kept fleets in its waters. The Bosphorus and Dardanelles were to be closed to ships of war other than Turkish, the sultan having power to open them to allies. But see BOSPORUS.

Black Snake (*Bascanium constrictor*, see COLUBER), a species of snake common in the United States of America from Louisiana to Connecticut. Barring the white throat, it is of an almost uniform leaden colour, is one of the largest serpents in North America, and is remarkable for its great agility. It moves along the ground with a swiftness equal to that of a horse, glides over bushes, and climbs trees. It feeds on small quadrupeds, birds, frogs, &c.; frequently plunders poultry-yards of eggs; and enters dairies to drink milk or cream. A persistent enemy of the rattlesnake, it is generally the conqueror in a struggle, enveloping its venomous foe in its coils and crushing it to death. It has no poison-fangs, but is not slow to bite. It is easily tamed.—One of the commonest Australian snakes (*Pseudochis porphyriacus*), found in marshy places, and somewhat cobra-like in its actions, is also called the Black Snake. The back is glancing black, the sides carmine, the belly red; the neck is not dilatate. It may measure over 6 feet in length. It is very venomous, belongs to the family Elapidae, and is nearly allied to the Cobra (q.v.).—In Victoria and Tasmania the name is given to several species of Hoplocephalus.

Blackstone, SIR WILLIAM, a silk-mercier's posthumous son, born in London 10th July 1723, from the Charterhouse passed to Oxford, and was elected a fellow of All Souls'; from the Inner Temple he was called to the bar, but failed to attract notice. In 1749 he succeeded an uncle

as recorder of Wallingford, in Berkshire; and in 1753 he delivered a course of lectures at Oxford on the law of England. Three years later, a Mr Viner having left £12,000 to endow a chair of English Law at Oxford, Blackstone was in 1758 appointed first Vinerian professor. Next year he returned to Westminster; and as the doctrines which he had taught as a lecturer had commended him to the Tory government of that day, he was made a king's counsel in 1761, in the same year becoming member for Hindon, in Wiltshire, and shortly after principal of New Inn Hall, Oxford. Other honours followed fast, and in 1763 he was made solicitor-general to the queen. In 1765-69 he published the four volumes of his lectures, which form his celebrated *Commentaries on the Laws of England*, and which brought him in £14,000. His practice, too, continuing to increase, he resigned in 1766 his Oxford appointments. Four years later he declined the solicitor-generalship, and, having been knighted, was made a justice of the Court of Common Pleas. He died 14th February 1780, and was buried at Wallingford.

Blackstone's fame rests wholly on his *Commentaries*. His seventeen other literary works, which included some youthful poetry, were inconsiderable, and his merits as pleader or judge were not of themselves such as to have made his reputation outlive him. As a commentator, he had many excellences. His style is in general clear and gracefully ornate, his illustrations are pleasing and felicitous. While he confined himself to exposition—to the accurate statement in scholarlike English of what had heretofore lain buried in the cumbrous language of lawyers like Littleton—Blackstone was unsurpassed, and rendered an important service to the country. But he was ambitious of combining with this exposition the higher task of explaining the reasons of law, as well as its merits and defects. For this survey of law from the legislator's point of view, he had not the requisite qualifications; his knowledge of English history was superficial, his study of the philosophy of law had been imperfect. With the works, indeed, of Montesquieu and Beccaria he was acquainted; but the mode in which he quotes them shows that he had imbibed nothing of their spirit. The method followed in the *Commentaries* was unscientific, and was taken from Sir Matthew Hale's *Analysis of the English Law*. But the comprehensiveness and accuracy of the work and its dignity of style made it in some respects the most influential treatise on English law. Innumerable editions of it have been published up till the 20th century; and all subsequent commentaries on the law of England, as well as those of Kent in America, were based on it.

Black Stream. See JAPAN (*Climate*), PACIFIC OCEAN.

Blackthorn. See SLOE.

Blackwall, a London district in the borough of Poplar, at the junction of the Lea with the Thames, 3½ miles ESE. of St Paul's. It has foundries, shipbuilding yards, East and West India Docks, and a tunnel under the Thames (opened in 1897).

Black Watch (Gaelic *Freiceadan Dubh*), the first of the Highland regiments, had its origin in a commission granted to John, second Earl of Athole, in 1668, 'to raise and keep such a number of men as he shall think fitt' to be a constant guard for securing peace in the Highlands. The term *black* arose from the dark colour of their tartan uniform, which distinguished them from the regular troops, called the *Saighdean Dearg*, or 'red soldiers.' From 1704 till the Union,

there were three companies in existence directly dealt with by the Treasury in regard to pay and clothing, and wholly armed with firearms. In 1729 the companies were six in number—three comprising 100 men each, commanded by captains, and three of 70 men each, commanded by captain-lieutenants. The body was raised chiefly from the Whig or loyal clans—Campbells, Grants, Munros, &c. The duties of the Black Watch were to enforce the disarming act, to prevent political meetings of a seditious kind, and to check depredation. After being of considerable use for these local purposes, the whole of the companies were formed into the 42d Regiment, under the command of the Earl of Crawford, in 1739; and in 1743 the regiment joined the troops in Flanders, and first went into action at Fontenoy, since when it has been one of the most distinguished corps in the British army. As it was embodied under a Lowlander, it was necessary to adopt an arbitrary pattern of tartan, which has ever since been known as the 42d or Black Watch tartan. When in 1881 the numerical designations of the British foot regiments were dropped, the former 42d and 73d Regiments were made respectively first and second battalions of the 'Black Watch (Royal Highlanders).' See HIGHLANDS; Forbes, *An Historic Regiment* (1896); and Ross in Lady Tullitardine's *Military History of Perthshire* (1908).

Black Water, RED WATER, MUIR-ILL, or HÆMO-ALBUMINURIA, a disease of cattle, best known as occurring in cows from ten to fourteen days after calving. The first symptom usually observed is a dark appearance of the urine, which comes away in a small stream and causes a heap of froth where it falls. As a rule this is accompanied by diarrhœa. On examination it is found that the pulse is more frequent and very distinct—very easily felt. The heart can sometimes be heard beating by one standing beside the animal. The diarrhœa is soon followed by constipation; the urine becomes darker, passing through red to brown, and sometimes even black; the appetite gradually fails; the secretion of milk diminishes, and if it be left standing in a vessel and then poured off slowly and gently, a red deposit will be found at the bottom.

It is a very fatal disease, and most frequently met with on poor badly drained soils. Whatever the cause the blood corpuscles are broken up and passed off by the kidneys, albumen and the colouring-matter of the blood being found in the urine.

A purgative should be given early while diarrhœa is present, with soft nourishing nitrogenous food, and when the appetite fails raw eggs and milk, with astringents and stimulants, as strong ale or porter. Post-mortem examination reveals bloodlessness, with a yellowish tinge of the tissues.

Blackwater, or HÆMOGLOBINURIC or HÆMATURIC FEVER, is an acute disease with feverishness, bilious vomiting, jaundice, and the passage of red or dark-brown urine. It affects persons of all colours in tropical Africa, both on the east and west coasts, and from the Upper Nile to Rhodesia. To a less extent it occurs also in the southern states of the Union, in Greece, and in some of the East Indian Islands. The cause is still somewhat uncertain. It is found in places where malaria is rife, and used to be regarded as a bad type of malaria. Later it was suggested that, though occurring in malarious subjects, it was really due to the destructive action on the red blood corpuscles of prolonged dosage with quinine. Still more recently it is believed to be due to an unknown poison, spread under the same conditions as the malaria parasite. The mortality is about 25 per cent. of all cases. In treatment careful nursing

is all-important, and large quantities of fluid should be given.

Blackwater, the name of numerous rivers and rivulets in Great Britain and Ireland, of which the longest are: (1) The Blackwater of Munster, 100 miles in length, which enters the sea at Youghal harbour; (2) the Blackwater of Ulster, 50 miles long, which falls into the south-west corner of Lough Neagh; and (3) the Blackwater of Essex, 40 miles long, which falls into the North Sea.

Blackwell, ALEXANDER, adventurer, seems to have been born in Aberdeen about the beginning of the 18th century, and to have been a younger son of the Rev. Thomas Blackwell (1660-1728), principal of Marischal College. He may, or may not, have studied medicine under Boerhaave at Leyden; anyhow, about 1730, he was a printer in London, and becoming bankrupt in 1734, was supported in prison by his wife, who published a *Herbal* (2 vols. folio, 1737-39) with 500 cuts of plants, drawn, engraved, and coloured by herself, her husband adding their Latin names, with a brief description of each. Next, in 1742, Blackwell turns up in Sweden, where, having cured the king of an illness, he was appointed one of the royal physicians, and undertook the management of a model farm. While still in the full enjoyment of court favour, he was charged with being concerned in a plot against the constitution, and after being put to the torture, was beheaded, August 9, 1747, protesting his innocence to the last.

Blackwell, ELIZABETH, the first woman that obtained a medical diploma in the United States, was born at Bristol in 1821. Her family emigrated to the States in 1832, and six years later the father died, leaving a widow and nine children. Elizabeth helped to support the family for some years by teaching, steadily devoting her leisure the while to the study of medical and anatomical books. At last she was permitted to enter the medical school of Geneva, N.Y., and to graduate in 1849. She thereafter lectured, wrote, and established a dispensary. In London she lectured on medicine as a profession for women, encouraged Drs Elizabeth Garrett Anderson and Jex Blake, and held a chair of gynecology in the London school for women. She died in June 1910. She was much assisted by her sister Dr Emily Blackwell (1826-1910). See her autobiographical *Pioneer Work* (1895; new ed. 1914).

Blackwell, GEORGE. See ARCHPRIEST.

Blackwell, THOMAS, scholar, a brother most likely of Alexander Blackwell (q.v.), was born at Aberdeen in 1701, and took his M.A. in 1718. In 1723 he was appointed professor of Greek in Marischal College, and in 1748 its principal. He died at Edinburgh, 8th March 1756. He was author of *Inquiry into the Life and Writings of Homer* (1735), *Memoirs of the Court of Augustus* (3 vols. 1752-64), and two or three other works.

Blackwood, or BLACVODÆUS, ADAM (1539-1613), an adversary of Buchanan and champion of Queen Mary and authority, was born at Dunfermline, and lived mostly at Poitiers.

Blackwood, WILLIAM, a distinguished Edinburgh publisher, the originator of *Blackwood's Magazine*, was born in Edinburgh, November 20, 1776. After serving his apprenticeship to the book-selling business in his native city, and prosecuting his calling in Glasgow and London, he settled in Edinburgh as a bookseller—principally of old books—in 1804. In 1817, having six years before become a publisher on his own account, he issued the first number of *Blackwood's Magazine*. The literary ability displayed in this periodical was so much in advance of the monthly magazines then existing, that from the first it was a great success. Its

remarkable popularity was sustained by the papers of Wilson ('Christopher North'), Lockhart, Hogg, and other spirits, whom Blackwood had the liberality and tact to attract to his standard. Overwhelming its political and literary opponents, now with the most farcical humour, and now with the bitterest sarcasm—sometimes with reckless injustice—the magazine secured for itself a prodigious reputation, more particularly among the Tories, of whose political creed it has always been a resolute adherent. William Blackwood himself, who added literary tastes and acquirements to his profession of a bookseller, was the chief manager of his magazine, and conducted the whole of the correspondence connected with it until his death, which took place September 16, 1834. His place was filled, between 1834 and 1852, by his sons, Alexander and Robert, the early death of the former cutting short a career of great promise. Under John (1818-79), the third son, who was editor from 1852, *Maga* not only sustained but increased its reputation. The publishing business has been greatly extended since the days of the founder of the house, 'George Eliot's' novels having all but one issued hence.

See Mrs Oliphant's *Annals of a Publishing House* (1897) and Sir George Douglas, *The Blackwood Group* (1897).

Bladder (urinary) is a hollow bag for the reception of the urine. When moderately distended it has a capacity of about a pint, but under various conditions it is capable of holding far more. Thus, the bladder of a drunkard has been seen so dilated that it held twenty pints, and when completely paralysed there is no limit to its distension. Instances of very large bladders are not infrequent in females, but this is probably the result of over-distension, and not due to the female bladder being naturally larger than that of the male. Indeed, competent authorities state that the reverse is the case.

In all young animals possessing a bladder, it is elongated in form, indicating that originally it was a tube. In an infant it is pear-shaped—the condition which is permanent in quadrupeds; but as man gradually assumes the erect attitude, the lower part expands under the weight of the urine. In the adult, its size, shape, position, and relations to surrounding organs vary according to its state of collapse or distension. When empty it sinks deeply into the pelvis, and appears flattened above and below; when moderately full its form is rounded, but still it remains within the pelvis; when completely distended it projects above the brim of the pelvis, becoming an abdominal organ, and having an ovoid or egg-shaped outline. It now presents a *base* or larger end directed backwards, an *apex* or *summit*—the smaller end—directed upwards and resting against the lower part of the anterior abdominal wall. At the front of the base, the *urethra*, which leads off the urine, commences abruptly in a thickened portion named the *neck*. At this point the bladder is fixed to the walls of the pelvis by fibrous bands named *true ligaments*. In all other directions it is freely movable, although receiving support from surrounding parts such as rectum or vagina, according to the sex, also to a slight extent from blood-vessels and the two ducts from the kidneys (ureters), and lastly from the peritoneum, which, on account of its various reflections from the organ, forms folds known as the *false ligaments*. The wall of the bladder consists of several layers or coats, in which blood-vessels and nerves ramify. The *outer coat* is formed of peritoneum, which only partially invests the bladder, being found on its upper and posterior half. The *next coat* consists of bundles of muscular fibres arranged in various directions. Between this and the lining membrane there is a well-marked layer consisting of areolar tissue, in which the

blood-vessels ramify, and named the vascular or *submucous coat*. The lining membrane (*mucous coat*) is soft and smooth. It is continuous with the lining membrane of the ureters and that of the urethra. Being loosely attached, it is nearly everywhere thrown into wrinkles, which disappear as the bladder is distended. If an imaginary line be drawn between the openings of the ureters, and from each end of this line others be drawn to the orifice of the urethra at the neck of the bladder, a triangular portion of the base will be mapped out, having its apex pointing forwards, and each side measuring about an inch and a half. Within this area, to which the name *trigone* is applied, there are never any wrinkles, even when the bladder is empty, because the mucous coat adheres more closely to subjacent parts. This area has a greater number of blood-vessels and nerves than other parts of the bladder, and therefore possesses more acute sensibility. As the urine accumulates in the bladder, its pressure on the trigone gives rise to the feeling of a full bladder and the necessity for micturition. The intense pain produced by stone in the bladder is due to the same cause (see *CALCULUS*). As the bladder becomes distended, its muscular walls begin to contract periodically upon the fluid contents; so do the muscular fibres which surround the outlet of the bladder—viz. the urethra. As long as the pressure within the bladder is not very high, the latter is able to resist the former, as is seen during sleep; but after a certain stage of distension is reached, the contractions of the bladder wall overcome those of the fibres closing the urethra, and the bladder is emptied. This process occurs naturally in young children, but as age advances the fibres surrounding the outlet of the bladder come under the control of the will, and thus the urine can be voluntarily retained or expelled. The bladder is liable to catarrhal inflammation of the coats, to paralysis, and other affections. Rupture of the bladder by accident is usually fatal. For incontinence of urine and retention of urine, see *URINE*. There is no urinary bladder in birds (see *BIRD*).

In general *zoological* usage, the term bladder is applied (1) to that outgrowth from the dorsal surface of the gut which forms the Air- or Swim-bladder (q.v.) of many fishes, and serves in a few cases as an incipient lung; and (2) to the urinary bladder. It is necessary to note, however, that the latter may have a very different origin in different animals. (a) In the gristly fishes the terminal extremities of the so-called 'Wolffian ducts' coalesce to form a urinary cloaca, which opens into the general cloacal chamber. (b) In the bony fishes the urinary bladder is a dilatation at the exit of the ureter. (c) In amphibia the bladder arises as an outgrowth from the hind-gut, and represents the allantois of higher animals. (d) In reptiles the stalk of the allantois dilates to form a permanent urinary bladder, which is absent in birds. (e) In mammals the stalk of the allantois again dilates to form the bladder.

Bladder Champion. See *SILENE*.

Bladder-cherry (*Physalis alkekengi*). See *WINTER-CHERRY*.

Bladder Green is derived from the Buckthorn (q.v.).

Bladder-nut (*Staphylea*), a very widely distributed genus of deciduous shrubs or small trees of rather elegant appearance, of the order *Staphyleaceæ*, allied to *Celastraceæ*. The Common Bladder-nut (*S. pinnata*) is frequently planted in shrubberies, as is also the North American *S. trifoliata*. The wood of both is firm and white, well suited for the purposes of the turner. The seeds yield a good oil, and may be eaten, but act as a mild aperient. The flower-buds are

pickled as capers. The name bladder-nut has reference to the curious inflated membranous



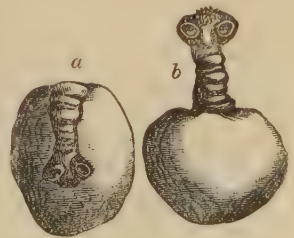
Common Bladder-nut (*Staphylea pinnata*):
a, a flower; b, fruit.

capsule, and the hard bony *testa* of the seed. The name *Staphylea* is from the Gr. *staphylê*, 'a bunch of grapes,' and has reference to the racemed flowers.

Bladder-seed (*Physospermum cornubiense*), an umbelliferous weed, noted for its inflated fruit.

Bladder-senna (*Colutea arborescens*), a leguminous tree of Southern Europe, occasionally planted in sheltered shrubberies. It owes its name partly to the dry inflated pod, partly to the tradition of the use of its leaflets for adulterating senna.

Bladder-worm, the asexual stage of a tapeworm or cestode. It is found encysted in a host which is likely to be eaten by the final host of the tapeworm. The stage owes its name to the bladder-like form resulting from the encysted embryo. Within the bladder a 'head' is developed (a in fig.), which is eventually turned outwards, and retains the bladder as a sort of appendage (b in fig.). In exceptional cases (see *HYDATIDS*) the bladder buds off internally, not one head but many. On passing to the final host the bladder-worm loses its bladder, and the head or scolex, becoming attached to the gut, buds off the familiar chain of 'joints,' which gradually become sexually mature. Before the life-history of cestoid parasites was understood, the bladder-worms were described



Bladder-worm.

as separate organisms, but they are now known to be simply the asexual stages of an 'alternation of generations.' Thus the *Cysticercus cellulosæ* or bladder-worm of the pig becomes the *Tænia solium* or tapeworm of man; the *C. mediocanellata* of ox, the *T. saginata* of man; the *C. fasciolaris* of the mouse, the *T. crassicolis* of the cat; the *Cœnurus cerebralis* of the sheep, the *T. cœnurus* of dog; the *Echinococcus* of man, the *T. echinococcus* of dog, and so on. The bladder-worm is more passive, vegetative, and entirely asexual; the tapeworm

joint is more active, its nutrition probably more stimulating and variable, its reproduction sexual. See CESTOID WORMS, TAPEWORM.

Bladderwort (*Utricularia*), a genus of Lenticulariaceæ, which like its congener the Butterwort (q.v.) is remarkable for its carnivorous habit. The two hundred species are often aquatic or floating, the leaves frequently floating, and divided, the flowers generally yellow. The stems and leaves bear the characteristic animal-catching pitchers. See INSECTIVOROUS PLANTS.

Bladensburg, a village of Maryland, on the east branch of the Potomac, 6 miles N.E. of Washington by rail. It was here that the battle which decided the fate of the capital was won by the British on the 24th August 1814.

Blackberry. See WHORTLEBERRY.

Blaes, a Scottish miners' name for the shale of the coal-measures, originating apparently from the 'blae' or bluish colour sometimes noticed in the shale. The term is occasionally used by geologists.

Blaeu (spelt also *Blaeuw* and *Blauw*, Lat. *Cæsius*), WILLEM JANSZON, a map-drawer and printer, was born at Alkmaar, Holland, in 1571. His Terrestrial and Celestial Globes excelled in beauty and accuracy everything that had preceded them; as also did some of his maps. He died in 1638. —His son, JAN (died 1673), commenced business on his own account at Amsterdam in 1637, but afterwards entered into company with his brother, Cornelis (died 1650). His *Atlas Major*, in 11 volumes, is a remarkable work, with many curious plates; and the maps are extremely valuable from the light they throw on local history. Besides six maps of Ireland, the volume on Scotland contains forty-nine maps of that country, prepared by Timothy Pont (q.v.), and a great amount of local details by Sir John Scott. He further published a series of topographical plates and views of towns. Two of Jan's sons carried on the business until 1700.

Blagodati, a hill (1260 feet) in the Urals, about 150 miles E. of Perm, is very rich in magnetic iron ore.

Blagovestschensk, or BLAGOVYESCHENSK, a town of the Far Eastern Republic, once capital of the Amur Province, at the confluence of the Amur and Seja rivers, with some manufactures, and 80,000 inhabitants. During the Chinese troubles in 1900 there was fighting on this frontier; and many Chinese (report said thousands) were said to have been 'massacred' or forced into the river by the Russians at Blagovestschensk.

Blaine, JAMES GILLESPIE, born at West Brownsville, Penn., in 1830, taught in a Kentucky military institute, and in the Pennsylvania institution for the blind. In 1854 he settled as a journalist at Augusta, Maine, and served in the state legislature from 1858 to 1862; from 1862 to 1876 he sat in congress, being Speaker in 1869-74. He was defeated in the Republican nominations for the presidency in 1876, 1880, 1884, and 1892. Senator for Maine in 1876, he acted as Secretary of State under Garfield, and again under Harrison (till 1892). He died January 27, 1893. He was the author of *Twenty years of Congress* (2 vols. 1884-86).

Blainville, HENRI MARIE DUCROTAY DE, zoologist and anatomist, was born in 1778, near Dieppe, studied medicine and the physical sciences at Paris, and in 1812 was appointed assistant-professor of Comparative Zoology, Anatomy, and Physiology, in the university, as well as professor of Natural History at the Athenæum; in 1825 a member of the Institute; and in 1832 successor of Cuvier in the chair of Comparative Anatomy in the Museum of Natural History. He died May 1,

1850. Blainville achieved great success, not only as a teacher, but as the author of *Faune Française* (1821-30), *De l'Organisation des Animaux* (1822), *Cours de Physiologie Générale et Comparée* (1833), *Ostéographie* (1839-64), &c.

Blair, HUGH, was born at Edinburgh in 1718, and in 1730 entered the university, where his *Essay on the Beautiful* gave his preceptors a high idea of his ability and taste. In 1741 he was licensed as a preacher, and after occupying the churches of Collessie in Fife, Canongate, and Lady Yester's, he was promoted in 1758 to one of the charges of the High Church, Edinburgh. His discourses, which display little power or originality of thought, and which derived nothing from the delivery of their author, were greatly admired by 'persons of the most distinguished character and eminent rank' in Scotland on account of their polished style. In 1759 he commenced a series of lectures on *Composition* to classes in the university; and in 1762 he was appointed to a new regius chair of Rhetoric and Belles-lettres, with a salary of £70 a year. He resigned this post in 1783, and in the same year published his *Lectures*, which obtained a reputation far beyond their merits, and one that time has by no means confirmed. His *Sermons* (1777) enjoyed the approval not only of Dr Johnson, but of George III., who showed his appreciation by bestowing on Blair in 1780 a pension of £200 a year. Blair also published three other volumes of *Sermons*, and a fourth appeared after his death, which took place December 27, 1800. They were all as successful as the first. Opinion about their merits has much changed since the date of their publication; they are now considered as moral essays rather than sermons. Blair's critical acumen was not great; he strenuously defended the authenticity of Ossian's poems.

Blair, ROBERT, author of *The Grave*, was born in 1699 at Edinburgh, where his father was a clergyman. There and in Holland he was educated for the church, and in 1731 he was ordained minister of Athelstaneford, Haddingtonshire, where he lived in easy circumstances till his death 4th February 1746. He was an accomplished and thoughtful man, devoted considerable attention to natural science, particularly botany, and corresponded on friendly terms with several eminent contemporaries, among others, Watts and Doddridge. To them in 1742 he submitted the MS. of his poem, which Watts offered to two publishers. They thought it too heavy for the times, and it did not appear till 1743. It speedily attained an honourable place in the esteem of those capable of appreciating a masculine, though somewhat gloomy force of thought and imagery, applied to a profoundly suggestive and serious theme. In William Blake it found a congenial illustrator. Blair was succeeded in his ministerial charge by Home, the author of *Douglas*. His third son, Robert Blair, of Avontoun (1741-1811), became Lord President of the Court of Session.

Blair-Atholl, a Perthshire village, situated at the confluence of the Garry and Tilt, 20 miles NNW. of Dunkeld. Blair Castle, the seat of the Duke of Atholl, dates in its oldest part from the 13th century, and as restored in 1872 is a fine baronial structure. It has many memories of sieges and royal visits, from Queen Mary's days to Queen Victoria's. Claverhouse was buried in the old church of Blair.

Blairgowrie, a town of Perthshire, very picturesquely situated on the right bank of the Eicht, 20 miles NNE. of Perth by a branch line (1855). It has flax spinning and weaving factories driven by the Eicht. Much fruit is grown. Pop. 3000.

Blaise. See BLASIUS.

Blake, ROBERT, next to Nelson the greatest of English admirals, was born at Bridgewater, the eldest of the twelve sons of a merchant there, in August 1599. From the grammar-school of his native town he passed in 1615 to St Alban's Hall, and shortly afterwards to Wadham College, Oxford, where he remained till 1625. He seems next to have continued his father's business, and to have prospered, but may from time to time have himself made voyages to distant seas, as prosperous merchants at that time very often did. He led the life of a quiet country gentleman until he had reached his fortieth year, and was returned for Bridgewater to the Short Parliament of 1640, that preluded the Civil War. He cast in his lot with the parliament without hesitation, but did not become a member of the Long Parliament till 1645. An ardent Republican, and a man of blunt, straightforward manners, singularly devoid of fear, and of inflexible character, he was much respected by Cromwell, but he never became personally very intimate with him. He served under Popham in Somersetshire, and attracted notice by his conduct at the siege of Bristol, and his obstinate defence of Lyme, in Dorsetshire, in 1644 against Prince Maurice. His defence of Taunton for nearly a year against overwhelming odds, when the town was little more than a heap of ruins, covered him with fresh glory, and proved a turning-point in the war.

In 1649 he was appointed with two others to command the fleet, at that time in a state of disaffection and weakness. Before two years he had blockaded Lisbon, destroyed the squadron of Prince Rupert, and forced the royalists to surrender the Scilly Isles and Jersey, their last stronghold. Early in 1652 began the struggle with the Dutch for the supremacy of the seas, and Blake found himself pitted against such redoubtable seamen as Van Tromp, De Ruyter, and De Witt. In the first engagement on the 19th May, though his fleet numbered over forty ships to Blake's fifteen, Van Tromp retreated under cover of darkness with the loss of two ships. It is right to add that the English ships were larger than the Dutch, and their artillery superior. On the 28th September Blake gave battle to De Ruyter and De Witt off the mouth of the Thames, both fleets about sixty-five ships in number. The fight ended with the flight of the Dutch next day. On the 29th November a fleet of eighty vessels under Van Tromp encountered Blake with scarcely forty off the Goodwin Sands. After a two days' hotly contested fight, victory remained with the Dutch. Blake lost six of his ships, but brought the remainder in a sadly shattered state into safety. In his report to the council of state he complains of the 'baseness of spirit, not among the merchantmen only, but many of the state's ships.' Van Tromp now scoured the Channel in triumph, and to this period belongs the apocryphal story of his having tied a broom to his mast-head. Blake asked to be released from his command, but by the middle of February 1653, he was again at sea with nearly eighty ships. On the morning of the 18th Van Tromp was sighted near Portland with about an equal force. A long running fight at once began, and lasted from Portland to Calais. Blake was severely wounded, but gained a complete victory, sinking five ships and capturing four, as well as over thirty merchantmen in Van Tromp's convoy. His ill-health prevented him from taking part in the engagement of the 31st July, which finally shattered the naval supremacy of Holland. In September 1654 he sailed with a fleet to the Mediterranean, and he soon made the English flag respected at Cadiz, Naples, and Leghorn alike. In April 1655 he sailed under the guns of Tunis, a nest of pirates, and burned a fleet of nine ships. He next sailed to Algiers, where the dey in terror

submitted to his terms. At the approach of winter he returned to England, but early in the spring of 1656 was cruising again off Cadiz. In September, Stayner, one of his lieutenants, fell in with the Plate fleet and captured it—a loss to Spain of nearly two millions in treasure alone.

But the crowning exploit of Blake's career was his last. Hearing early in April 1657 that a fleet from America had arrived at Santa Cruz de Teneriffe, he at once sailed thither, and on the morning of the 20th arrived in the bay where there were sixteen ships lying at anchor, 'moored close along the shore, which lies in a semicircle, commanded as far as the ships lay by the castle, and surrounded besides with six or seven forts.' Before night he completely destroyed the fleet and the town, and contrived to draw off, owing to a favourable change of wind, with a loss of 50 slain and 120 wounded. The wonderful daring and success of this exploit excited the utmost enthusiasm throughout England, and admiration throughout Europe. But it was the last of the great admiral's glories. With health fast failing, he returned homewards to die just as his ship entered the harbour of Plymouth, 7th August 1657. Cromwell honoured his memory by a stately funeral, and caused him to be interred in Westminster Abbey, whence the body was ousted at the Restoration. A window to his memory was placed in St Margaret's, Westminster, in 1888. Blake's skill and courage were equalled only by his disinterested patriotism, sterling honesty, and love of justice; he not only gained a decided superiority over England's mightiest naval opponent, but, by the boldness and novelty of the tactics he introduced, taught English seamen to attempt every enterprise, however difficult and doubtful, with the same reckless and easy daring. See Hannay's *Admiral Blake* (1886) in 'English Worthies.'

Blake, WILLIAM, engraver, painter, and poet, was born in London on the 28th of November 1757, the son of a hosier. He was a dreamy boy, addicted to drawing and verse-making, and fond of solitary rambles in the country, during which he believed that he saw visions of angels in the sky and among the trees. At the age of ten he began to study art in Par's Academy in the Strand, and four years later he was apprenticed to James Basire, the engraver, in whose antiquarian prints he assisted, and for whom he executed drawings from the ancient monuments in the churches of London and its neighbourhood. His apprenticeship ended in 1778; and, after studying in the Antique School of the Royal Academy, he began to produce water-colour figure-subjects, and to engrave illustrations for the *Ladies' Magazine*, and, after Stothard, for the *Novelists' Magazine*. His first picture exhibited in the Royal Academy was 'The Death of Earl Godwin,' shown in 1780. His leisure had from early years been devoted to the composition of poems, of which the first volume, the *Poetical Sketches* by W. B., published in 1783, is full of true pastoral feeling and of an exquisitely spontaneous lyrical power. This work, with the *Songs of Innocence* (1789), and the *Songs of Experience* (1794), include the finest examples of Blake's poetry, for the so-called 'Prophetic Books'—the *Book of Thel* (1789), the *Marriage of Heaven and Hell* (1791), the *French Revolution* (1791), the *Song of Los* (1795), and many others—are strangely mystical and unintelligible, their text being usually interwoven with imaginative designs. In 1906 Mr Sampson for the first time printed the text verbatim from the poet's MS.

All his poetical works, with the exception of the *Poetical Sketches* and *The French Revolution*, were produced in a method peculiar to the

artist himself, a method which, he related, was communicated to him in a vision by the spirit of a deceased brother. Their text, with its illustrative designs and decorative marginal enrichments, was inscribed upon copper-plates with a kind of stopping-out varnish, and the surrounding metal was then bitten away with acid, the result in each case being a plate in relief, which was printed on paper with ink of various tints, the impressions being finally coloured with extreme beauty and elaboration by the artist's own hand. His innumerable designs of poetic and imaginative figure-subjects were usually executed in washed monochrome or in water-colours. They include a superb series of 537 coloured illustrations to Young's *Night Thoughts*, of which 43 subjects were engraved by Blake and published in 1797, and 12 designs to Blair's *Grave*, which were etched by Schiavonetti and published in 1808. In his paintings Blake used a method which he was accustomed to style 'fresco'—in reality a process of tempera upon a ground prepared with glue and whiting. Among the most important of such works is 'The Canterbury Pilgrims,' purchased by Sir William Stirling-Maxwell of Keir, Perthshire, which the artist himself engraved, a picture quaint in conception, and showing the errors and exaggerations of form common in the artist's productions, but full of character and individuality; 'The Spiritual Form of Pitt guiding Behemoth,' now in the National Gallery, London; 'Jacob's Dream,' shown in the Royal Academy of 1808; and 'The Last Judgment,' one of his latest paintings, executed for the Countess of Egremont. It is, however, in his engravings from his own designs that Blake's finest artistic work is to be found; and among these the 21 'Illustrations to the Book of Job' hold the first place. They were the production of the artist's old age, published in 1826, when he was verging upon seventy. In imaginative force and visionary power they are unequalled in modern religious art and unsurpassed in the art of the past, while the directness and spirit of their method recalls the works of Durer and the other great painter-engravers of the 15th and 16th centuries. They were followed by the illustrations to Dante, upon which Blake was employed at the time of his death. He is also known as a wood-engraver by his series of 17 cuts contributed to a now very scarce edition of Thornton's *Virgil*. Though rude in execution, these prints are full of the very spirit of idyllic poetry, and their *technique* shows a remarkable perception of the true direction and special capabilities of the special artistic method.

During his life Blake met with little encouragement from the public. The exhibition of his works, which he held in 1809 in Broad Street, was a complete failure; his name was unknown to ordinary picture-buyers, and even at the end of his life, when he was producing his immortal 'Illustrations to the Book of Job,' he occupied, with his ever-faithful wife, a single small room in Fountain's Court, Strand. Yet he had his own little circle of true-hearted friends. The poet Hayley rendered him not ineffectual aid; Flaxman was his friend from youth; among his disciples in age were Samuel Palmer and John Linnell, whose generous assistance freed his last days from pecuniary anxiety. All through his life he was upheld by vivid faith in the unseen, guided, as he believed, by perpetual visitations from the spiritual world. He died on the 12th August 1827.

A lost series of 114 drawings in sepia or ink, coloured in wash, illustrating Gray's poems, came to light in 1919 in Hamilton Palace (reprod. 1922). See editions of the works by Ellis and Yeats (1893), of the poems by Gilchrist (1880) and by Sampson (1905; 1921); Swin-

burne's essay (new ed. 1906); Keynes's bibliography (1921); books by Berger (1907), Symons (1907), De Selincourt (1909), Chesterton (1911), Nicoll (1922), and, for his work in art, by Binyon (1906) and Russell (1912).

Blanc, MONT. See MONT BLANC.

Blanc, JEAN JOSEPH LOUIS, was born 29th October 1811, at Madrid, where his father was inspector-general of finance under King Joseph. After finishing his school education he went to study in Paris. For two years he was a private tutor at Arras, and in 1834 returned to Paris, where he contributed to various political papers, and where in 1839 he founded the *Revue du Progrès*, in which he first brought out his chief work on Socialism, the *Organisation du Travail*, which in 1840 appeared in a separate form. The book obtained for its author a wide, enthusiastic popularity among the French workmen, who were captivated by the brilliancy of the writing, the simplicity of the scheme, and the freshness of the views advocated. The book denounces the principle of competitive industry, and proposes the establishment of social workshops (*ateliers sociaux*), composed of workmen of good character, and subsidised by the state. These workshops, conducted on the co-operative principle, and on the basis of an equitable remuneration for all engaged in them, would, he thought, in the process of time absorb all the industry of France. Next, in 1841-44, Blanc published an historical work, entitled *Histoire de Dix Ans* (1830-40), which produced a deadly effect on the Orleans dynasty. Louis-Philippe afterwards declared that 'it acted like a battering-ram against the bulwarks of loyalty in France.' It owed its success partly to the exposure it made of the scandalous jobbery and immorality of the crown and its advisers, partly to that passionate ardour which changed the tranquillity of history into the vehemence of a pamphlet. This was followed by the first volume of a *Histoire de la Révolution Française*, in which the author's aim was to describe from his own point of view not only the incidents of the first revolution, but the social history of the 18th century. On the breaking out of the revolution of February 1848, Blanc had an opportunity of playing a most important part. His great popularity with the working-classes led to his being appointed a member of the Provisional Government, and he was placed at the head of the great commission for discussing the problem of labour, which had its sittings in the palace of the Luxembourg. At the same time, Marie, Minister of Public Works, began to establish the so-called national workshops (see ATELIERS NATIONAUX), which, however, were in no sense an attempt to carry out the views of Blanc. Blanc was accused without reason of a share in the disturbances of the summer of 1848, and escaped to London, where he spent many years. During his exile, he devoted himself to political and historical literature. He finished his *Histoire de la Révolution Française*, and carried on a large correspondence for the French journals, a selection from which was published in the bright and charming *Lettres sur l'Angleterre*. On the fall of the Empire, Blanc returned to France, and was elected to the National Assembly in 1871. After 1876 he was member of the Chamber of Deputies. In both these bodies he voted and acted with the extreme Left, but without exercising any great influence on the course of events. He died at Cannes, 6th December 1882. Louis Blanc was a man of genial and amiable personality, and a sincere believer in the most advanced political and social opinions, which he advocated with polished and fervid eloquence, but he was not robust enough to be a revolutionary leader.

Blanch, or **BLENCH HOLDING**, is one of the ancient feudal tenures in the law of Scotland without service or prestation, except as a mere badge of superiority, the duty payable to the superior being in general a trifling sum, as a penny Scots, or merely illusory, as a peppercorn, 'if asked only,' or a bunch of roses, or, as in the famous case of Jock Howieson, a service of ewer and basin that the king may wash. Anciently, many estates in Scotland were held, both of the crown and other superiors, by this tenure, and by the legislation which followed on the Rebellion of 1745 all the ward-holdings or military tenures in Scotland were converted into blench; but it is now seldom adopted in the constitution of an original right of property. The tenure is subject to the same casualties of non-entry and relief as that of Feu (q.v.). See **CHARTER, TENURE**.

Blanchard, **EDWARD LAMAN**, journalist and theatrical writer, a son of William Blanchard, the comedian, was born in London, 11th December 1820, and early in life showed great aptitude for journalistic work and compilation for the publishers. Long a member of the *Daily Telegraph* staff, he wrote over a hundred pieces for the theatres, including many Christmas extravaganzas; he also published two novels. He died 4th September 1889. See *Life* by Clement Scott and Howard (1891).

Blanchard, **LANAN**, born at Yarmouth, 15th May 1804, became a journalist in London in 1831, and died 15th February 1845. He was a popular writer of light literature. His prose essays were collected in 1846 as *Sketches of Life*, and his poetry in 1876.

Blanching, or **ETIOLATION**, is a process of culture resorted to by gardeners, to prevent certain secretions which, in ordinary circumstances, take place in the leaves of plants, and to render them more pleasant and wholesome for food. The action of light is indispensable to the decomposition of carbonic acid by the leaves of plants, and, consequently, to the elaboration of many of the substances from which they derive their peculiar qualities; the exclusion of light, therefore, renders them white or nearly so, and deprives them of much of their natural coarseness and bitterness. In cabbage and some other cultivated plants, the leaves of which form themselves into compact heads, there is a process of natural blanching. Artificial blanching is managed (1) by earthing up the leaves and succulent stems of plants, such as celery, asparagus, &c. For this purpose celery is planted in trenches, and earth is gradually drawn in round the stems as they advance in growth. (2) By tying together the leaves with strings of matting, as is sometimes done with lettuce, endive, &c. (3) By overlaying, which can be done with tiles, slates, pieces of board, or utensils made for the purpose. The most common is the blanching-pot, used to exclude the light from seekale, rhubarb, and some other culinary vegetables, in which the green colour is to be avoided. The common blanching-pot is of earthenware, in a sugar-loaf form, which is used in France for blanching lettuce, and in the Pyrenees for blanching celery, &c. Though so simple and easy, blanching is of great importance in gardening. Without it such a plant as seekale is uneatable if not poisonous; with it the common dandelion has become a wholesome and even medicinal article of salad.

Blanc-mange (Old Fr. *blanc-manger*, 'white food'), a dish formerly made of fowl, meat, eggs, &c.; now of gelatine or isinglass and milk, or of corn-flour and milk.

Blanco, **CAPE**, a remarkable headland on the west coast of Africa, in 20° 47' N. lat., and 16°

58' W. long., the extremity of a rocky ridge which projects W. and S., and forms a commodious harbour. Other headlands of the same name occur in Spain, Greece, Morocco, Oregon, Costa Rica, Peru, and the Philippines.

Bland, in Orkney and Shetland, a subacid beverage made out of the serous part of milk, of hot whey, or buttermilk and water.

Bland Act. See **BIMETALLISM**.

Blandford, a town in Dorsetshire, on the right bank of the Stour, 10 miles NW. of Wimborne. It lies in a fine tract of pasture-land, famed for its multitude of cows. It suffered much in 1579, 1677, 1713, and 1731, from fire, only twenty-six houses escaping on the last occasion. It is built of brick, and is neat and regular; its chief charm is Bryanston Park, Lord Portman's seat. It was formerly famed for its manufactures of bandstrings and lace, the point-lace bringing £30 a yard. Shirt-buttons are made here. Population (which has decreased since 1890), 3200.

Blandrata, **GIORGIO**, properly **BIANDRATA**, the founder of Unitarianism in Poland and Transylvania, was born of a noble family at Saluzzo, in Piedmont, about 1515. The freedom of his religious opinions compelled him to flee to Geneva in 1556, where he remained till Calvin's displeasure at his anti-trinitarianism drove him to Poland for liberty of thought and speech. Finally, in 1563, he betook himself to the court of John Sigismund, Prince of Transylvania, whose favourite physician he became. Here he exerted himself with as much prudence as assiduity to spread his doctrines, and succeeded in forming a considerable party. He died about 1590, strangled, so it was said, by his nephew, as he slept.

Blane, **SIR GILBERT**, physician, was born at Blanefield, Ayrshire, in 1749. He studied at Edinburgh University, and in 1779 sailed with Lord Rodney to the West Indies, where his gallantry under fire gained him the appointment of physician to the fleet. In 1783 he was elected physician to St Thomas's Hospital, London. As head of the Navy Medical Board, he was instrumental in introducing the use of lemon-juice and other measures for the prevention or remedy of diseases on board ship. In 1812 he had a baronetcy conferred upon him. He died June 26, 1834. He published several works.

Blank Bonds. See **BONDS**.

Blankenberghe, a village on the coast of West Flanders, 9 miles N. of Bruges by rail and canal, with a harbour and lighthouse. There are fisheries and shipbuilding, and the place is a popular summer-resort. Pop. 7000 (in summer 60,000).

Blankenburg, a town and summer-resort of Brunswick, 37 miles SSE. of the capital, on the borders of the Harz Mountains. Pop. 11,500, many of them miners.—There is another Blankenburg, a favourite bathing-place with 3000 inhabitants, in Thuringia, 25 miles S. by W. of Weimar.

Blankenese, a town of Holstein, on the Elbe, 6 miles W. of Altona, a resort and residence of Hamburg people; pop. 6000.

Blanket (O. Fr. *blankete*, from *blanc*, white), originally a kind of undyed woollen cloth; now a large sheet of woollen (or other) material used as a covering for a bed, a horse, or an Indian.

The best qualities of blankets made in England are wholly of wool, but what may be called a typical English blanket of medium or inferior quality is generally formed of cotton warp and woollen weft threads, since, owing to the peculiar way much of the wool is spread in an open pile over the surface of the fabric, the cotton gives it strength. One of the chief aims of the manufacturer is to

raise the fibres of the woollen yarn into a loose, soft mat on the face of this kind of blanket, which hides the threads below. This is effected by Teazles (q.v.), or steel brushes, in what are called gigs or brushing-machines. Scotch blankets, even of ordinary quality, on the other hand, are entirely made of wool, and are finished in a different way, the pile on the surface not being sufficient to hide the twilled pattern into which they are woven. An imitation of the Scotch blanket is made in some mills at Sowerby-Bridge in Yorkshire. Cloth or Bury blankets, again, have a surface more like ordinary woollen cloth. Witney, Kersey, Yorkshire, and Bath are the best-known varieties of English blankets. Dewsbury is the principal centre of the trade. The Scotch blanket-mills are chiefly situated in Ayrshire, Berwickshire, and at Markinch in Fife. Some blankets made in Ayrshire are not of the ordinary Scotch type. The 'Witney' and 'Bath' are perhaps the most comfortable blankets made in Great Britain, but none of the English kinds can compare with the Scotch blanket for economy. The latter is by far the most durable.

The more expensive kinds of American blankets excel in weight, thickness, softness, and perfection of face. The lowest grades, composed of shoddy, hair, and the coarsest wool, which are saleable abroad, cannot be disposed of in America—even the Indians will not have them. Extraordinarily fine woollen blankets are made in Mysore; some, it is said, so delicate that, though as much as 18 feet long, they can be rolled inside a hollow bamboo.

Blanketeers, a body of Manchester operatives who on 10th March 1817 met in St Peter's Field, provided each with a blanket for bivouacking. They meant to join a contingent from Derby, and march on London; but they were dispersed.

Blanks, SPANISH, certain papers, blank but for the signatures of Errol, Huntly, and others, intended to be filled up with an agreement to help a Spanish invasion of Scotland (1592). The papers were intercepted, and Errol and his friends raised a rebellion, and afterwards withdrew from Scotland.

Blank Verse, or verse without rhyme, a name applied especially to the iambic pentameter or unrhymed five-foot iambic, the so-called heroic verse, the regular measure of English dramatic and epic poetry. The first specimen of blank verse in English is a translation of the second and fourth books of Virgil's *Æneid*, by the Earl of Surrey (beheaded in 1547); but it had been used freely by Italian and Spanish writers as early as about the beginning of that century. The first example of an English poem of any length (not dramatic) in blank verse is *The Steele Glas* (1576) of Gascoigne. Two short poems of Nicholas Grimald, published in *Tottel's Miscellany* in 1557, are the earliest specimens in English of original blank verse. In England the adaptation of this verse to the drama (first in Sackville's *Gorboduc*), from the freedom gained by the variations of the pause, was at once felt, and in that department of poetry it soon became and has continued dominant, if we except the effort made by Dryden and others, after the Restoration, to return to rhymed plays. For dramatic purposes the four-accent line is too short, and breaks the sense too often, while the six-accent line is so long as to be tedious without the relief of rhyme. The five-accent verse was a satisfactory mean between the two. The dramatic line, representing the language of actual life, approaches more nearly to prose, and consequently enjoys more license than any other metre. Not merely is the trochee freely substituted for the iambus after any pause however slight, but an extra syllable is also allowed at the end of a line or sentence (even in Milton), and in some cases even two extra

syllables, if these do not interfere with the regular recurrence of the accent.

Of course in verses of five accents it is impossible to divide the line into two *equal* parts, so that there must needs be variation in the position of the pause to avoid what would otherwise be unendurable monotony. In verse without rhyme much of the beauty of the rhythm depends on the poet's skillfulness in the variation of the pause, and no one has varied it with more boldness and finer effect than Milton. Professor Mayor points out that 'Tennyson and Browning, as compared with Milton, have more lines with final, but without internal pause; somewhat fewer with internal, but without final pause; about the same without any pause at all. As to the forbidden internal pauses, they use the pause after the first, third, and ninth syllables more frequently than Milton, and do not differ much from him in their use of the pause after one and a half, two, and eight. With regard to the middle pauses, those which divide the feet, coming after the fifth or seventh syllable, are more favoured by the moderns than by Milton, whose commonest pause is after the sixth syllable, and then *longo intervallo* after the fourth. The pause after the fourth seems to be Tennyson's favourite, while Browning seems to prefer the fifth and seventh. This last also abounds in Swinburne. Feminine ending is very rare in Browning, but in Tennyson is hardly less frequent than in Milton. Nor is there any marked difference as regards substitution of feet, except that the non-initial trochee is more common in Milton than in the others.' The initial trochee is as common in Surrey as in Milton. The rhythm of the former is frequently harsh and abrupt. Trisyllabic feet are not infrequent, and as often as not there is no middle pause. Marlowe's rhythm is much more regular in accentuation than Surrey's, but occasionally we find monosyllabic feet and lines of nine syllables formed by initial truncation. Feminine rhythm is also more frequent than in Surrey's usage, and even the two superfluous syllables at the end of the line occur here also. Many of Shakespeare's defective lines are capable of explanation by a pause or a lengthened syllable. Examples of elision and slurring are frequent, and trisyllabic feet are not uncommon, but genuine Alexandrines are not numerous. The superfluous syllable at the end is rare in his earlier plays, but there is a steady increase in its use in the later plays. It is but rarely a monosyllable, still more rarely an emphatic monosyllable. Such amphibrachic or 'double endings' are especially common in Fletcher's verse.

Dryden followed Corneille in demanding rhyme for the dignity of tragedy. He sums up its advantages in aid to the memory, in additional grace added by the sweetness of rhyme to the smartness of a repartee, and in the limits that it lays upon fancy, which without such restraint tends to outrun judgment. Milton's *Paradise Lost* (1667) was the first great poem in our literature written in blank verse. Appended at the publisher's request was a short preface in three sentences, entitled 'The Verse.' Here the poet, with customary vigour of phrase, claims exemption from 'the troublesome and modern bondage of riming . . . to all judicious ears, trivial and of no true musical delight . . . no necessary adjunct or true ornament of poem or good verse, in longer works especially, but the invention of a barbarous age, to set off wretched matter and lame metre.' From Milton's time blank verse has been as common a form for narrative, didactic, or descriptive poetry, as rhymed couplets with their 'jingling sound of like endings.' Some would restrict the name blank verse to the ordinary heroic metre or lines of ten syllables; by others the

term is applied more widely to unrhymed lines, irrespective of their length, from such examples as the *Hiawatha* of Longfellow, which contains eight syllables in its lines, to his *Evangeline*, which has as many as sixteen or even more.

The five-foot iambic appears early in both Italian and French, but in neither did it shake off the bondage of rhyme, as it did in England by the middle of the 16th century, so as to offer a sufficiently strong and flexible form for dramatic and epic poetry. French influences long exercised a restraining effect on its use in German, but English freedom made its way through the efforts of the elder Schlegel, Wieland, Klopstock, Herder, and others, until Lessing employed the unrhymed five-foot iambic in his *Nathan* in 1778, and thus set a precedent for its use in dramatic poetry. In earlier German verse in this measure as in French, each five-foot line was complete in itself, but Lessing introduced the usage of the Italians, and still more the English, of connecting lines by *enjambement* and building them up into long periods. Schiller's first plays were written in prose, but in 1786 he began to employ the five-foot iambic as modified by Lessing.

See J. B. Mayor's *Chapters on English Metre* (1886), with its summary of an essay by Zarncke (1865); and works by Guest, Bridges, Symonds, Schipper, and Saintsbury.

Blanqui, JÉRÔME ADOLPHE, a French economist, was born in 1798 at Nice, and commenced the study of philology at Paris, where he became acquainted with J. B. Say, who induced him to turn his attention to political economy. In 1833, on the death of Say, he was appointed professor of Industrial Economy in the Conservatoire des Arts et Métiers, and became one of the editors of the *Dictionnaire de l'Industrie*. In 1838 he became a member of the Academy of Moral and Political Sciences. Later he travelled in several countries to study their economic condition. He died at Paris, 28th January 1854. As an economist, he was a follower of Say, and in favour of free-trade, and he recognised the social difficulties of his time. In method he is ingenious, in style transparent and lively. His most important work is the *Histoire de l'Economie Politique en Europe* (1838).—His brother, LOUIS AUGUSTE BLANQUI, born at Puget-Théniers (Alpes Maritimes) in 1805, made himself conspicuous by his passionate advocacy of the most extreme opinions, for which he suffered with the pride of a martyr. He was one of the foremost fighters in all the French revolutions of that century. In 1830 he was decorated for his valour at the barricades. In 1848 he figured as the chief organiser of the popular movement under the Provisional Government. He took the lead also in the revolutionary *attentat* of the 15th May, the aim of which was to overthrow the Constituent Assembly. At the head of an excited mob, he demanded of the French representatives the resuscitation of the Polish nationality, while one of his friends pronounced the dissolution of the assembly. For his share in these disturbances he was rewarded with ten years' imprisonment in Belleisle. In 1861 Blanqui was sentenced to other four years' imprisonment. After the downfall of the second empire in 1870, Blanqui resumed his revolutionary activity, and in 1871 took a prominent part in forming the Commune. Being too unwell to endure transportation in New Caledonia, he was condemned to imprisonment for life, from which he was released in 1879. He died January 1, 1881, having spent nearly half his life in prison.

Blantyre, or HIGH BLANTYRE, a village of Lanarkshire, situated near the right bank of the Rotten Calder, 8½ miles SE. of Glasgow by rail, in a coal and iron mining district. At the now decay-

ing village of Low Blantyre, 1¼ miles NE., David Livingstone, a native, worked in a weaving-factory; here also are his memorial church and statue.—Also a Scottish mission-station founded in 1876 in Nyasaland, on the heights between the Upper Shiré and Lake Shirwa, in a well-wooded district.

Blaps, a genus of Black Beetles (q.v.), with more than 100 species. They are dark and darkness-loving forms, wingless, leisurely in their movements, feeding on dead vegetable matter, and with the power of ejecting for several inches an acrid fluid of pungent odour. *Blaps mortisaga* is a common British species, of about an inch long, and of a shining black colour. It is sometimes called Darkling Beetle, and Churchyard Beetle, and sometimes seems to share with the Cockroach (q.v.) the appellation of Black Beetle. It is a frequent companion of the cockroach in pantries and cellars, and used to be thought a messenger of death, but is rather frequent for such an ominous function.—*Blaps sulcata* is cooked with butter and eaten by Turkish women to make them fat.



Blaps.

Blarney is the name of a castle 8 miles NW. of Cork, in the outer wall of which, 20 feet from the top and so quite inaccessible to ordinary visitors, is a stone bearing the date 1446, said to endure any one who kisses it with heroic powers of cajolery.

Blasco Ibáñez, VICENTE, Spanish novelist, born at Valencia in 1867, deals in realistic fashion with provincial life and social revolution. Notable among his novels are *La Catedral* (trans. 1909), *Sangre y Arena* (trans. 1913), *Los Cuatro Jinetes del Apocalipsis*, and *La Barraca*. The two last mentioned, translated in 1919, established his popularity with English readers. He has been found fault with for bad taste and provincialisms; but Mr W. D. Howells reckoned him the greatest of living novelists since the death of Tolstoi.

Blasius, St, Bishop of Sebaste, Cappadocia, suffered martyrdom in 316. His relics are abundant. The wool-combers claim him as patron, because iron combs were used to tear his flesh. He was also invoked in extracting a thorn or anything sticking in the throat. His day is 3d February.

Blasphemy, according to the canon law, was either heretical or simple. The former consisted in denying God or an article of faith, and this was regarded as injuring the reputation of the Deity, and shocking the mysteries of religion. Simple blasphemy, on the other hand, consisted in making untrue and unbecoming statements about God, the Virgin, or the saints. These offences were severely punished both at Rome and in the Cismontane churches, though not with the capital penalty which was usual against blasphemers under the Jewish law. In England the law is partly statutory. A statute of 1698, repealed in 1813 so far as it protected the doctrine of the Trinity, declares it to be an offence 'to assert that there are more gods than one, to deny the Christian religion to be true, or the Holy Scriptures of the Old and New Testaments to be of divine authority.' The punishment is incapacity to hold office, and on a second conviction imprisonment for three years. Under this statute such writers as Matthew Arnold, F. W. Newman, and J. S. Mill could undoubtedly

have been convicted, serious and high-minded as are their books. But the prosecutions for blasphemy in England have been under the common law, and there is a difference of opinion among the highest authorities whether the simple reverent statement of certain opinions amounts to blasphemy, or whether a scoffing and contumelious spirit is not necessary to complete the offence. The older cases, such as that of Woolston who in 1728 attacked the Christian miracles, Williams who published Paine's *Age of Reason* in 1797, Carlile in 1819, and Moxon who sold Shelley's *Queen Mab*, tend to show that, as Lord Kenyon said, 'the Christian religion is part of the law of the land,' and therefore that to question its truth, however seriously, is an offence. The theory of such convictions is much weakened by the legislation permitting jurors and witnesses to avoid the oath, for it was thought that the theological sanction of Christianity was necessary for the due administration of justice. But the case of Cowan, who in 1867 proposed to lecture on 'the character and teachings of Christ; the former defective, the latter misleading,' confirms the view that blasphemy depends on the character of the matter published, not the manner in which it is stated. The opposite doctrine, however, was laid down by Lord Coleridge in the case of Foote and Ramsay in 1883, and is now generally accepted. The complete toleration of religious opinion which now exists renders it improbable that any one will be prosecuted for a decent expression of disbelief in Christianity. But the point is not beyond doubt, for so great an authority as Mr Justice Stephens favours the view expressed in Cowan's case, though he admits that there is 'some authority in favour of a different view of the law.' It may be pointed out that, as in the case of Page Hopps at Glasgow in 1874, Unitarian books are held not to be blasphemous at common law, and to be therefore entitled to copyright. This would seem to imply that the principle laid down in Foote's case is right. In Scotland there is also a statute law and a common law of blasphemy. Under the Act of 1661 (repealed in 1813) the punishment was death, but the acts now in force are those of 1825 and 1837, under which blasphemy may be visited with fine or imprisonment, or both. It was under the early régime that the atrocious judicial murder of Aikenhead, with the approval of the ministers of Edinburgh, was perpetrated in 1697. As in the case of the Edinburgh booksellers, Paterson and Robinson, in 1843, it is a crime at common law to publish an impious book devised to ridicule or bring into contempt the Scriptures or the Christian religion. The accused in these cases were sentenced to fifteen and twelve months' imprisonment. Holyoake was imprisoned six months at Gloucester for 'bringing God into disbelief.' The courts of the United States also hold that one who maliciously uses language calculated to sap the foundations of society and public order may be punished; but evil motive is essential to the offence, and discussion of religious doctrine is not to be interfered with.

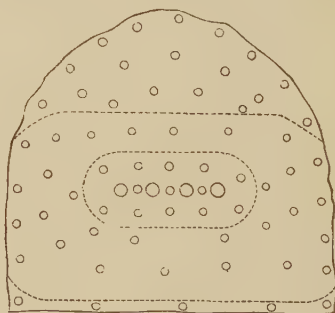
Blast-furnace. See BLOWING-MACHINES, IRON.

Blasting is the method of loosening or shattering masses of solid fracturable matter by means of explosive compounds, an operation of fundamental importance in engineering and mining. Previous to the invention of gunpowder the only means of quarrying stone and of extracting minerals from the earth was by the hammer, chisel, and wedge, or by the expansive power of heat. For obtaining large regular blocks of stone the wedge is still often used, and blasting has to do not quite so much with quarrying as with mining of all kinds, with disintegrating rock in the sinking of shafts, the

cutting of tunnels, the formation of roads and railways, the removal of obstructions to navigation, and generally the shattering or displacement of solid masses. While there are indications of the use of gunpowder for military mining in the 15th century, the first record of its employment for ordinary blasting is 1627, at a mine near Schemnitz.

The explosives commonly used in blasting consist of gunpowder and preparations of nitro-glycerine, nitro-cotton, or gun-cotton, and of several nitrates and nitro-compounds. Nitro-glycerine (q.v.) is now never used in the free condition in Great Britain, and abroad probably used only in exceptional circumstances. As Dynamite (q.v.), and in a great number of other blasting explosives, it is absorbed and retained by various ingredients with comparative safety, but somewhat (often adversely) diminished blasting efficiency. Ammonium nitrate is the base of a number of other, generally less powerful, blasting explosives specially designed for use in coal-mines where danger of explosion from 'fire-damp' or coal-dust may exist. Numerous other explosives have been proposed and introduced; but many of them, from their instability, or from the great risks of their manufacture and handling, are prohibited under the provisions of the Explosives Act. To meet the objection to explosives in confined spaces and in 'fiery' mines (as they give off a certain amount of poisonous gas when fired), the expansion of quicklime when wetted, compressed air, and wedge-machines have been used for splitting rock and coal. The first mentioned has been dropped, but the two latter are still used in certain special circumstances, though useless for hard strata or for rapid work.

The use of modern explosives renders three kinds of blasting practicable—(1) the small-shot system, (2) the mine system, and (3) surface blasts. The small-shot system consists in boring holes, 1 inch to 1½ inch diameter, sometimes more, and from 18 inches to 6 or 7 feet into the material to be blasted. The boring is done either by hand or machine power (see BORING). The hole is cleaned out, and the charge, generally in the form of a cartridge of sufficient diameter for the bore, is placed in its extreme end, and the remainder of the hole is tamped or closed with sand or clay. If the cartridge be filled with an explosive such as gunpowder, which only requires simple ignition to explode it



Section of a Tunnel.

with full effect, a Fuse (q.v.), such as Bickford's, passes through the tamping to the cartridge; but if the explosive be one which requires detonation to develop its complete force, the fuse is attached to a *detonator* (a small metal tube containing from twelve to thirty grams of fulminate of mercury) embedded in the cartridge. The fuse is cut to a length which will burn for a sufficient time to enable the workmen to get clear of the effects of the explosion. Firing by electric fuse

from a distance is, however, increasingly employed, especially when a number of shots have to be fired simultaneously, for in the latter case the difficulty of getting burning fuses to act at the same moment is considerable. 'Cordeau détonant,' i.e. a high explosive, such as trinitrotoluene, in a lead tube, is a new means of bringing about simultaneous firing. One tube connects all the charges, and the enormous velocity of detonation (about 18,000 feet per second) of the tube brings about a result practically equal to that obtained by electric firing, and less liable to derangement. In tunnelling and shaft-sinking, a series of shot-holes which embrace the superficial area to be excavated are driven and exploded in a connected manner, a core or central set being first fired off, after which a ring of shots around the core are simultaneously fired, and so on till the whole area is embraced.

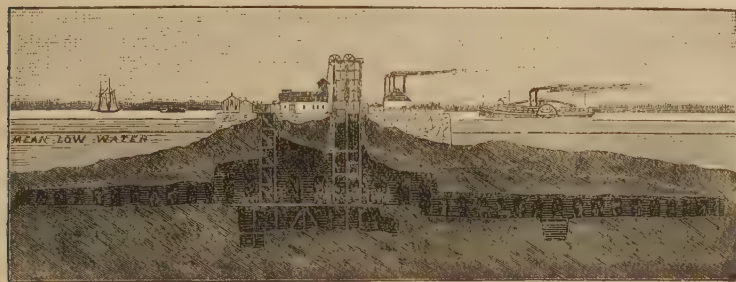
The system of shot-holes is very similar for all forms of blasting, but the explosive used is carefully selected according as it is desirable or not that the material blasted shall be broken into small

3 inches—in all, more than 20 miles of drill-holes. Into each of these was inserted, first, a cartridge of rackarock—79 parts chlorate of potash and 21 dinitrobenzole; and, second, a cartridge of dynamite, the two together filling the entire bore. In all, there were used 240,399 lb. of rackarock and 42,331 lb. of dynamite. Water was admitted to the mine, and it was exploded on the 10th October 1885. Over 80,000 cubic yards of rock were tunnelled out, and 270,700 cubic yards were blasted.

Surface blasts are explosions produced by firing the explosive simply in contact with or placed near the substance to be shattered. Such blasts have become possible only since the introduction of detonating explosives. Gunpowder fired in an unconfined space would spend its force through the air, and produce little local effect; but the detonation of nitroglycerine, gun-cotton, and other nitro-compounds is so sudden that it acts with enormous violence in every direction, though within a limited area. Thus blasts of detonating compounds laid on the surface of any rock, &c., and fired by a detonator,

operate downwards and produce great shattering effects (see Detonation under GUN-COTTON). Surface blasts have been largely used in removing reefs and other obstructions to navigation in the Long Island Channel, New York, the scene of the greatest of blasting operations.

In recent years, especially in America and Canada, blasting has been much employed for clearing old forest land of the



Section Diagram of Hell Gate Tunnels.

pieces. For such a material as coal a comparatively gentle explosive would be employed; whereas for blasting out hard rock, the debris of which is to be used as road-metal, the most powerful explosive available would probably be used.

Large blasts or mines are resorted to when great masses of rock have to be removed at once, or when a large supply of irregularly broken stone is required. These blasts are of two kinds—shafts sunk from the top of the rock, and headings or galleries driven in from the face. In a shaft mine the charge of powder is placed in a chamber cut at one side of the shaft, so that the tamping may not be in the direct up-line of fire. It is exploded by electricity, the wires from the battery being protected from injury from the rough tamping by being embedded in battens placed up one side of the shaft. Headings are driven, if possible, along a natural joint in the rock. The explosive may be divided and placed in two or more separate chambers, and it is better to distribute large charges than to fire them at one centre. The charges in these mines vary from 600 lb. to 13,000 lb. of powder, and even more, and they should dislodge from 3 to 6 tons of stone per lb. of powder exploded. The Round-down Cliff at Dover was in 1843 overthrown by a blast of 18,500 lb. of powder in three separate charges. An enormous blast was made in slate-quarries near Llanberis in October 1893, when some 235,000 tons of granite were displaced by 6850 lb. of blasting gelatine (see GUN-COTTON). The removal of Hell Gate or Flood Island, in Long Island Sound, New York, required the greatest blast the world had seen. The island, 9 acres in extent, was honeycombed under low-water mark with tunnels—24 galleries running in one direction, intersected by 46 at right angles. These galleries were pierced in every direction with drill-holes, of which there were bored 12,561, with a depth of 9 feet and a diameter of

stumps of trees, and even for breaking up soil to an extent which would be impossible with the most powerful ploughs.

Blastoderm, the layer or layers of cells arising from the germinal disc, or the portion of a partially segmenting egg which undergoes division; see EMBRYOLOGY.

Blastoids. See ECHINODERMS.

Blastophaga. See CAPRIFICATION.

Blatchford, ROBERT, born at Maidstone in 1851 of actor parents, was bred a brushmaker, and served in the army and as a clerk. After being on the staff of *Bell's Life* and the *Sunday Chronicle*, he founded and edited the *Clarion* in the interests of socialism and free thought. Among his works are *Merrie England*, *Tommy Atkins*, *A Son of the Forge*, *A Bohemian Girl*, *God and my Neighbour*, *Not Guilty*, *Sorcery Shop*.

Blauwbok, a large South African antelope, now extinct; see ANTELOPES.

Blavatsky, MADAME. See THEOSOPHY.

Blaydon, a manufacturing town of Durham, 5 miles W. by S. of Newcastle; pop. 33,000.

Blaye, a river-port on the Gironde, 20 miles NNW. of Bordeaux, at the base of an eminence crowned with Vauban's citadel (1652); pop. 5000.

Blaze de Bury, HENRI (1813-88), born at Avignon, translated *Faust* and wrote on Goethe and the German poets, on society under Augustus, and on the great musicians.—His wife (1814-94), named Stewart, born at Oban, and bred in France, wrote much both in French and English.

Bleaching (A.S. *blæcan*, from *blæc*, *blác*, 'pale,' 'bleak') is the whitening of textile materials or fabrics by the removal of coloured substances natu-

rally present or adhering to them in the course of their manufacture. It is also used to signify the decolouring of beeswax, castor-oil, and similar fatty materials by exposure to sunlight, sometimes in presence of water. From time immemorial open-air bleaching, with sun exposure, has been applied to linen and cotton fabrics, and is still for the most part the method adopted for domestic purposes. The strong bleaching power of direct sunlight is strikingly seen in the case of a wax or paraffin candle coloured with some of the aniline or vegetable dyes, an hour or two sometimes sufficing to discharge the colour. In diffuse daylight they also bleach, but much more slowly. Many dyes on textile fabrics, as is well known, soon fade if much exposed to the sun's rays.

It was formerly the custom to send linen goods manufactured in Scotland to be bleached in Holland, and the name *Holland* is still retained for a kind of unbleached linen. Another variety, which, from its fineness, was generally spread on the better grass-fields or lawns, received the name of *lawn*, still in use for a fine white linen. In those days large areas of grass land, and several months' exposure to air, light, and moisture, were required to bleach linen white. The first bleachfield in Scotland was established by the Fletchers at Salton in East Lothian about 1730; others were started soon after at Ormiston and Perth. Near Perth, and in Fife, there is still a good deal of open-air bleaching combined with chemical treatment. Bleach-works were also early set agoing about Glasgow and Aberdeen.

Andrew Yarranton, writing in 1677, mentions that a bleachfield then existed in Southwark by the side of the Thames, but there does not appear to be much known about early bleachfields in England.

In the old Dutch process the linen was immersed for some days in an alkaline lye of crude potashes, which removed a large quantity of the natural colouring matter and stains. It was afterwards treated with sour milk before it was spread on the grass. The process, including the field bleaching, took from six to eight months. Dr Home of Edinburgh discovered about 1756 that dilute sulphuric acid did better for the 'souring' operation than sour-milk, an improvement which shortened the time occupied in bleaching by one-half.

The modern process of bleaching calico, linen, and other fabrics of vegetable fibre, may be said to date from 1785, when Berthollet read to the French Academy an account of his investigations on the power of Chlorine (q.v.) to destroy colouring matters. A knowledge of the use of chlorine as a bleaching agent appears to have been first brought to this country by the Duke of Gordon and Professor Copland of Aberdeen, who communicated it to a firm of bleachers in that town. James Watt, who knew Berthollet, made the process successful at a bleachfield near Glasgow, and along with Dr Henry of Manchester, explained it to the Lancashire manufacturers of cotton cloth, a branch of industry then rapidly rising in importance. Mr Charles Tennant of Glasgow took out, in 1798, a patent for making a solution of the chloride of lime, and afterwards in 1799 made this substance in the solid state by exposing dry slaked lime to chlorine gas, which it readily absorbs in large quantity. This was a discovery of great importance. Under the name of *Bleaching Powder* this solid chloride of lime continues to be the chief material used as a bleaching agent. This substance is commonly called chloride of lime, but as explained under BLEACHING POWDER its exact nature is still uncertain.

Bleaching of Cotton.—The cotton fibre as removed from the seed consists essentially of cellulose, but also contains various impurities, which

must usually be removed to a greater or less extent in order to render the fibre suitable for dyeing, &c. These impurities consist mainly of fatty and waxy matters, pectic substances, and small quantities of mineral matter, and on the average do not exceed in amount 5 per cent. on the weight of the raw cotton. Manufactured cotton fabrics also contain a considerable amount of other impurities—e.g. starches, fats, soaps, oils, &c.—which are added to assist the manufacturing operations.

The principles underlying the usual bleaching process are as follows: (1) the removal of the fatty, waxy, and pectic matters by means of alkalies; (2) the removal of mineral matter by acids; (3) the destruction of the residual colour by oxidising substances. The details given below refer to the bleaching of cotton-cloth or calico, which is by far the most important branch.

For convenience in handling, the pieces are usually sewn together end to end so as to make a long band of cloth. In most cases they first undergo the 'singeing' operation in order to remove the loose fluff from the surface of the cloth. This is carried out by passing the pieces very rapidly in the open width over copper cylinders or plates heated to redness, or else over a row of Bunsen-gas flames. For the remaining operations the cloth is not kept in the open condition, but the long band is allowed to twist up into a rope-like form, and is run over winches from one machine to the next in that condition.

The exact process employed varies greatly, but the following is an example of a 'full bleach,' which consists of the following operations: (1) the gray wash or steep; (2) the lime boil or bowk; (3) the lime or gray sour; (4) the lye boils; (5) the chemick; (6) the white sour. A thorough wash with water is given between each of the above operations. For the *gray wash* the pieces are steeped for some time in water to which a little malt extract or other chemical substances are sometimes added. This operation converts a portion of the starchy impurities into soluble substances by a process of fermentation, so that they can be removed by a wash with water. For the *lime boil* the pieces are impregnated with milk of lime in a 'liming-machine,' so as to take up about 4 to 5 per cent. of their weight of lime, and are then run into a 'kier' (see below) and boiled for several hours with lime-water either without, but usually with, pressure. The usual explanation of this process is that the lime decomposes the fatty and waxy impurities, forming insoluble lime-soaps, which remain adhering to the goods, but are removed by later operations. After the lime boil the cloth is well washed with water, first in the kier and afterwards in a washing-machine (see below). The *gray sour* consists in passing the washed pieces through a solution of hydrochloric or sulphuric acid of about $\frac{1}{2}$ to 1 degree Twaddle in strength. This decomposes the lime-soaps, liberating the fatty acids which remain adhering to the cloth, and removing the lime and other mineral matter in the form of soluble salts. A good wash follows. The next operation, the *lye boil*, consists in boiling the cloth in a kier with soda ash or other alkali. This is frequently carried out in two stages, the pieces being first boiled with a solution of soda ash, caustic soda, and resin-soap, and then with soda ash alone, followed by the usual good wash. This operation removes the fatty acids and other impurities, and leaves the goods almost white except for a slight yellowish tinge, which is removed by the next operation—that of *chemicking*. For this the pieces are run through a very dilute solution of bleaching-powder of about $\frac{1}{2}$ to 1 degree Twaddle, left to lie for some time, and then (sometimes after washing) run through the

white sour (like the gray) to complete the decomposition of the bleaching-powder and to remove the lime, and finally well washed with water, opened out again to the full width, and dried, which completes the process.

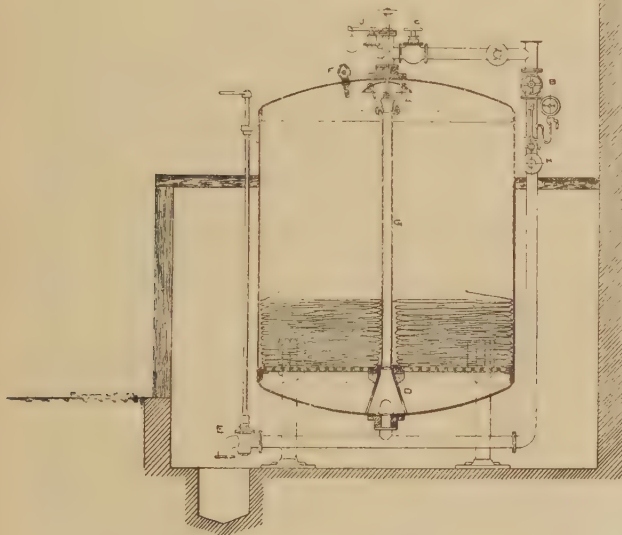
Boiling Kiers.—The kiers employed for the lime and lye boils are of various kinds, but usually have the form of vertical iron cylinders which hold from one to five tons of cloth. In order to get satisfactory results a good circulation of the liquors used is most important. This is usually effected by steam-injectors, pumps, or vacuum arrangements, or by a combination of these. When injectors are employed they effect the heating of the liquor at the same time, but for the others a special heating installation must be provided, which usually consists of a tubular heater placed outside the kier. In some cases the boiling is done in open vessels, but much better results are obtained by boiling under pressure, and there is a considerable saving of time.

An example of a high-pressure injector kier (Sir James Farmer & Sons, Limited) is shown in the annexed diagram. It consists of a large, vertical, cylindrical vessel made of steel or other suitable metal, and holding about three tons of cloth. The pieces are packed as evenly as possible in the kier after liming, and rest on a perforated

the pressure has risen sufficiently it ejects some of the liquor out of the open top of the pipe against a baffle-plate or spreader, A, which distributes it over the top of the goods, through which it gradually sinks until the steam pressure has risen again so as to eject another lot of liquor in a similar manner to the first. By this arrangement the liquor is thrown up in an intermittent or 'vomiting' manner. This kier is fitted with a safety-valve, J, and also with an inlet-valve, C, through which steam or water can be passed into the kier as required.

Another form of kier in large use is the 'Mather kier.' In this the cloth is packed into perforated iron wagons holding about two tons each, and two of these are then run on rails into the kier, which consists of a horizontal iron cylinder or boiler. The kier is then closed, and the necessary liquids are showered over the cloth in the trucks by means of pumps. After the cloth has been washed with water in the kier the door is opened and the wagons are run out, and two more which have been already filled with cloth are run in, and the same process carried out. By this method there is a considerable saving in the time required for filling and emptying the kiers.

Of recent years the process of bleaching in the open width has found considerable favour. In



High-pressure Injector Kier.

plate placed near the bottom of the kier. The top of the pile of cloth is covered with a sheet, and prevented from rising too high in the kier during the boiling process by means of weights or chains. Water is then run in so as to cover the goods, the lid is closed, and steam is blown in to remove the air, which escapes by the air-valve, F, after which the latter is closed. The circulation is effected as follows: Steam enters by the valve B, passes down the descending-pipe, and enters the bottom of the kier in the form of a jet. This jet is placed beneath the conical end, D, of the puffer-pipe, G, which runs up the centre of the kier and projects above the surface of the liquor. The liquor in the goods sinks through the perforated plate, and enters this pipe through openings in the conical portion, and rises to a certain height in the puffer-pipe. When steam is turned on, the rush of steam up the pipe carries the liquid up with it, and when

this process the pieces are passed continuously in the open width through closed rectangular vessels which are fitted with rollers to carry the cloth and have water-seals at the inlet and outlet places. In these kiers the cloth is subjected to alternate treatments with boiling alkaline liquids, and to a steaming process which takes place above the surface of the liquor in the closed kiers. The chemicking and souring follow as usual in other machines. Caustic soda and soda ash are the chief chemicals used in the Mather and open-width kiers.

Of recent years the lime boil has been much less employed than formerly, and the cotton is often simply given one or more lye boils, washed, chemicked, soured and washed. This is the process usually employed for loose cotton and yarn. For cotton which is to be dyed in dark shades a simple boiling out with soda is frequently sufficient.

Washing-machines.—For the repeated washings, the old dash-wheel is still to some extent used, and is a very efficient machine, but the operation can be got through in much less time by some more recent machines. One of these consists of a pair of squeezing rollers

with suitable framework placed over a cistern, through which there is a continuous flow of clean water. The pieces of calico, joined at the ends, pass in a rope-like form between these rollers, descend into the water, pass round a submerged roller, and return to the pressure rollers, from which they again descend to the cistern. In this way, guided by a rail with pegs, the calico travels round in a spiral direction, descending and ascending till the operation is finished.

Electric Bleaching.—Of recent years the use of sodium hypochlorite prepared by the electrolysis of solutions of common salt has attained some prominence. Omitting numerous side reactions, the main effect of passing a current of electricity through a solution of common salt is expressed by the following equations: $\text{NaCl} = \text{Na} + \text{Cl}$; $\text{Na} + \text{H}_2\text{O} = \text{NaOH} + \text{H}$; $\text{Cl}_2 + 2\text{NaOH} = \text{NaOCl} + \text{NaCl} + \text{H}_2\text{O}$; the final result being a solution

containing sodium hypochlorite and chloride, together with smaller quantities of other substances produced by the side reactions referred to above. The solutions thus obtained have the advantage over bleaching powder solutions that they contain no lime, so that the souring process can be omitted, a simple washing with water being sufficient to remove the easily soluble soda salts. However, the plant employed in its manufacture is expensive, and unless electric-power can be obtained at a very low price the process is more expensive than the use of bleaching powder in the ordinary way.

Bleaching of Linen.—Flax fibre from which linen is made contains a much larger amount of impurities than cotton. On an average they amount to about 30 per cent., as compared with 5 per cent. in the case of cotton. The process of water-steeping or 'retting,' which is the first stage in the preparation of the fibre, also causes a darkening of the fibre. The impurities consist largely of pectic and mucilaginous bodies. The process of bleaching linen is very similar to that employed for cotton. Owing, however, to the structure of the fibre, which consists of bundles of filaments adhering together, the separation of which must be avoided as much as possible, very dilute chemical solutions must be employed; and owing to the large amount of impurities the various operations must be repeated one or more times in order to get a good bleach. One operation which is peculiar to linen-bleaching is the 'crofting' or 'grassing,' which consists in spreading the material on the fields and exposing it to the action of the weather at different stages of the bleaching process.

Bleaching of other Vegetable Fibres.—Jute can be bleached by means of bleaching powder, but it is better to use sodium hypochlorite in place of the lime compound. Jute is easily injured by chemicals, so that the solutions should be used weaker than is the custom with cotton.

Hemp, coconut fibre, and other less important vegetable fibres are usually bleached by first treating them with hot soda solutions and then with solutions of bleaching powder.

Bleaching of Paper.—Rags, esparto grass, straw, wood, jute, and other materials are used for making paper, and these are usually bleached in the state of half stuff—i.e. after they have been so far reduced in the beating-engine. White papers are largely made of esparto mixed less or more with rags. The half stuff is bleached with chloride of lime, which is subsequently washed out. Afterwards the paper material is generally treated with an 'antichlore,' consisting either of hyposulphite of soda or of hyposulphite of lime, to remove the last of the chlorine, which, if left, would rot the paper. Straw is easily bleached, but this is not the case with wood. When straw is used for making bonnets, it is bleached with sulphurous acid.

Bleaching of Wood.—Trials made in 1887 in the bleaching of wood for ornamental purposes by means of peroxide of hydrogen have proved very successful. The wood is cut up to the required thickness, which may be from one twenty-fifth to one-fifth of an inch, and immersed in a bath of this liquid kept alkaline by the occasional addition of ammonia. In a few days this thin boarding appears almost white and transparent. It dries without shrinking or losing strength. The grain and veining, it is said, lose nothing of their distinctness from being subjected to the process; only the colouring disappears.

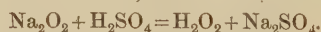
For the bleaching action of charcoal, and especially animal charcoal, on organic colouring matters in solution—such as the watery extracts of barks for medical purposes, brown sugar, paraffin, and a few other bodies—see CHARCOAL.

Bleaching of Wool.—Animal fibres such as wool and silk cannot be bleached by the methods employed for vegetable fibres, as they are easily injured by alkaline liquids and bleaching solutions. Raw wool as it comes from the sheep is contaminated with a considerable quantity of impurities, consisting chiefly of the following: (1) fatty and waxy substances forming the 'wool fat'; (2) the wool perspiration, chiefly the potash salts of various fatty acids; (3) dirt of various kinds—earth, vegetable matter, &c.; (4) colouring matter.

The first step in the purification is the removal of the impurities of the first three classes by the operation known as 'scouring.' This usually consists of a treatment with lukewarm soap solutions to which small amounts of soda, ammonia, or other mild alkali are sometimes added. The process is carried out in a series of long, shallow, rectangular tanks which contain the scouring liquor. The wool is entered at one end and gradually moved through the liquor to the other end by means of an arrangement of automatic rakes which give it a very gentle motion. All rapid movement must be avoided, as the wool very readily felts or knots together, and so causes losses in the subsequent manufacturing operations. The wool is passed through two or more of these machines, each of which contains a cleaner soap solution than the preceding one, and is then rinsed in water and dried. The wool fat, although insoluble in water, forms an emulsion with the soap solution, and is thus removed.

There are several methods for removing the actual colour from wool, the most important being that known as 'stoving' or 'sulphuring.' The well-scoured wool is placed in a closed chamber, the fumes of burning sulphur are then passed in, and the wool left exposed to them for several hours. The reaction is $S + O_2 = SO_2$. In some cases the sulphur dioxide is applied in the form of its solution in water. The SO_2 reduces the colouring matter to colourless substances. A better but more expensive method consists in the use of hydrogen peroxide. The wool is soaked for several hours in a solution of this substance, which is gradually heated to about 120° F., then lifted and rinsed. The colour is destroyed by oxidation, $2H_2O_2 = 2H_2O + O_2$.

Hydrogen peroxide is a very unstable body, and its solution is very bulky, so for convenience it is usually prepared as wanted from peroxide of soda. On dissolving this in water and adding acid, hydrogen peroxide is formed, thus:



Silk Bleaching.—Raw silk consists essentially of two substances: the true silk fibre or 'fibroin,' and the surrounding layer of silk-gum or 'sericin.' There are also traces of other substances. In order to develop the full beauty of the fibre the silk-gum must be removed more or less completely. This process, which is called the 'de-gumming,' is carried out by treating the silk (tied up in bags) in two or more hot soap-baths, which dissolve away the gum. The bleaching proper is carried out either by sulphuring or else by treatment with hydrogen peroxide as for wool. In order to save the great loss of weight caused by the total removal of the silk-gum (20-30 per cent.), other methods are frequently employed which leave a considerable proportion on the fibre and yet develop the valuable properties of the fibre to some extent.

Consult Duerr, *Bleaching and Calico Printing* (1896); Knecht, Rawson, and Loewenthal, *A Manual of Dyeing* (1910); *The Dyer and Calico Printer*; *The Journal of the Society of Dyers and Colourists*.

Bleaching Powder, a compound formed by the action of chlorine on dry slaked lime (see BLEACHING), was first manufactured on a large scale in Glasgow by Messrs Tennant & Co. The

use of chlorine for bleaching was introduced into Glasgow in 1789 by Watt, the engineer. At first it was used in the form of solution; but soon the addition of an alkali to the liquid was found to be beneficial, and the 'Eau de Javelle,' as this compound was called, was generally used. The next improvement was the substitution of lime for the alkalies, when Mr Charles Tennant in 1798 patented his *bleaching liquor*. In 1799 his partner proposed the use of dry slaked lime, and from that time to this the bleaching powder has remained unaltered in its nature. The manufacture of bleaching powder is one of the leading chemical industries of Great Britain, and at the present time it is looked on as the prop which supports many other industries, more especially the Leblanc soda manufacture. At one time the large quantities of hydrochloric acid gas produced in the manufacture of washing soda were allowed to escape into the air, destroying all vegetation for miles around. Restrictive acts of parliament, limiting the amount of gas which might be allowed to escape, resulted in the production of liquid hydrochloric acid, which was allowed, in many cases, to run into the streams. The manufacture of Chlorine (q.v.) and of bleaching powder utilised the by-product and became the nucleus of a very important industry; and on the introduction of the Brunner-Mond process for making soda, bleaching powder enabled old soda-works to make the bleaching powder pay for the loss on the soda they manufactured. For the decomposition of salt into sodium and chlorine, see SODA; see also HYDROCHLORIC ACID. An electrolytic or electro-chemical method of producing caustic soda and chlorine—i.e. from the decomposition of salt in water by means of strong electric currents—was begun on a commercial scale in 1894, and large quantities are produced thus at Niagara Falls. In the manufacture of 'bleach' the chlorine is passed into large stone or leaden chambers (60 feet long by 30 wide, and 5 high), on the floor of which a layer of dry slaked lime, about 6 inches deep, is placed, and this is allowed to remain in contact with the chlorine for some hours, during which time the temperature rises considerably. The greater part of the unabsorbed chlorine having been drawn into another chamber, the door is opened, and the lime stirred up with rakes to ensure uniformity, the strongest bleaching powder being found on the surface. Care is taken to transfer it to casks without exposure to wet or sunshine, as either of these is sufficient to induce decomposition and render it worthless. A more expeditious method of manufacture is now used, which originated in Germany, where the bleaching powder is made from electrolytic chlorine.

In either case, the resulting product consists of hypochlorite of calcium, CaCl_2O_2 , along with a variable proportion of chloride of calcium, CaCl_2 , and uncombined lime. Its value is judged (see CHLORIMETRY) by the amount of chlorine which it can give up for bleaching purposes, the present market strength varying from 33 to 39 per cent. of chlorine, or 'available chlorine,' as it is called. Bleaching powder is a grayish-white powder, with a powerful odour resembling chlorine. It rapidly absorbs moisture in a damp atmosphere, at the same time losing its bleaching properties. Rubbed with water in small quantity, it forms a thin cream; but on the addition of more water, thickens to a paste, which again becomes thin when more water is added. It is principally used in the bleaching of paper and linen; but as a disinfectant it is extensively applied in the purification of sewage or other obnoxious matter, its virtues from this as from every other point of view depending

on the freedom with which it liberates chlorine. In the manufacture of chloroform large quantities of bleaching powder are required, and no practical process for producing this substance has as yet been devised which can dispense with bleaching powder.

Bleak (*Alburnus lucidus*), a little fresh-water fish belonging to the great Carp family (Cyprinidæ), in the Physostomi division of bony fishes, in which the air-bladder (if present) opens into the gullet. Roach, dace, and minnow are familiar allies. The body is elongated and compressed, and measures 6 or 7 inches; the mouth is directed upwards; the chin projects; the nature of fins and tail is shown in the figure. The upper surface is bluish green, the sides and under surface silvery, the fins white or transparent. The bleak is common in European



Bleak (*Alburnus lucidus*).

rivers north of the Alps, and especially frequents quiet flowing water. Its active motions on the top of the water are familiar to anglers on English rivers. These fish form a large part of the food of pike, trout, and such fishes. Cooked like sprats, they are a satisfactory dish. As in related forms, the scales are coated internally with a silvery substance, which has for many ages been used for producing artificial Pearls (q.v.) and the like.

Blebs (allied to *blow*, *bubble*), same as Bulla (q.v.).

Bled, VELDES, or GRAD, a Slovenian village of Yugoslavia, 30 miles NW. of Laibach, on a beautiful lake, has a castle, a pilgrimage church on an island, and lake and sun baths.

Bleeding, or HEMORRHAGE, is one of the most serious accidents which can happen to an animal, and constitutes the most anxious complication in surgical operations. As there is but a limited quantity of blood in the body (corresponding to about one-tenth of its weight), and as the sudden escape of a large portion of it is sufficient to cause death, every one should be instructed as to the measures which experience has shown to be the most efficient for preventing a dangerous loss of blood.

Bleeding may be from a wounded artery or vein, or from a capillary (minute vessel); and it may be in the form of a general oozing from the surface of a sore or a mucous membrane. We shall consider these varieties separately.

Arterial bleeding is recognised by the florid redness of the blood, and by its issuing from the cut vessel *per saltum* or by jerks. There are exceptions to this, however. When an artery has been tied, and bleeding occurs from below the ligature, the flow of blood is continuous, and of a dark colour.

If a large artery be severed, the first gush of blood may prove fatal, but more usually the patient faints, which implies a great diminution in the force of the circulation; and nature takes advantage of this respite to place the cut artery in circumstances as favourable as possible to the preservation of life—viz. the artery draws up within its sheath (see ARTERY); the blood, no longer impelled so vigorously by the heart, clots between the cut end of the vessel and the cellular tissue surrounding it; the inner and middle coats not only retract but contract, and another clot forms

within the arterial tube. These clots—which, with the faintness and the contraction and retraction of the artery, are termed natural *hemostatics* ('blood-stoppers')—are sufficient in many cases to prevent a recurrence of the bleeding; but such a happy concurrence of circumstances is not to be depended on, and we must be prepared to adopt some of the many surgical or artificial means for restraining the flow of blood till Adhesion (q.v.) can occur between the cut surfaces of the coats of the artery. The principal surgical means are:

Immediate pressure, which may be applied by pressing the finger-tip on the place whence the blood is seen to flow. This may be kept up by pads of lint, or a coin of convenient size wrapped in cloth, and secured with a bandage to the part.

Pressure on the artery above, or as it comes to the cut part. This requires some knowledge of anatomy, but not more than any intelligent person may easily acquire. Thus, pressure on the inside of the upper arm, about midway between its front and back, will press the Brachial Artery (q.v.) against the bone, and arrest any bleeding from wounds of the forearm and hand. Pressure on the middle of the groin with a thumb placed crosswise will control the stream of blood in the femoral artery, so that none can escape from any wound of the lower limb below where the pressure is made. This pressure with the finger or thumb is very difficult to maintain with an adequate amount of firmness and continuity: hence it is well to substitute the handle of a door-key wrapped in cloth, for the direct pressure of the finger-tip, which rapidly becomes relaxed by fatigue.

Pressure on the course of the vessel may be very efficiently effected by tying a handkerchief (see *BANDAGE*) round the limb above where it is injured, and then inserting a stick next the skin and twisting. This is the principle of the original tourniquet, invented by Morel, a French surgeon, at the siege of Besançon in 1674. He got the idea from seeing how carriers tightened the ropes which secured bales of goods on their carts. It has been modified from time to time. At present it consists of a strong cylindrical strand of india-rubber long enough to encircle the limb four times; a chain attached at one end, a hook at the other. It is wound round the limb tightly, and the hook catches the link supplying most suitable pressure.

Pressure on the main vessel leading to a limb is only a temporary method of stopping bleeding, since it is not only very painful, but fraught with danger to the limb, which may mortify if it be too long continued. In a healthy man such pressure may be continued for five or six hours with impunity in case of urgent necessity, but a longer suppression of the circulation would almost certainly be followed by partial or complete death of the limb.

'Actual' cautery, or hot iron, is occasionally useful in bleeding from a bone, or at some points where pressure cannot be efficiently applied. It is the oldest method of stopping bleeding, and until the 18th century was much in use; but its abuse has almost banished it from the list of surgical hemostatics.

Thermo-cautery is a hollow blunt platinum knife which cuts by burning through soft tissues (e.g. piles, tongue), stopping the bleeding as it progresses by sealing up the vessels. It is heated to cherry redness by pumping benzolene through its interior. Convenient and cleanly, it cuts soft parts speedily, and stops all three forms of hemorrhage.

Ligature, or tying the artery, is a very old method of arresting hemorrhage, and certainly the best. It was not used generally, however, in operations until improved anatomical knowledge and more efficient tourniquets allowed surgeons the time necessary for its application.

Another method was introduced by the late Sir James Y. Simpson of Edinburgh, and was termed by him *Acupressure* (q.v.), or pressure from a long needle or pin inserted from without, so as to press the artery between it and the tissues. The pins are removed after twenty-four or forty-eight hours. This plan promised to supersede the older kinds of ligature, especially in amputations, where the vessels can be easily secured, and where occasionally they are found so brittle from disease (see *ATHEROMA*) as to break under the pressure of a thread, but, since the introduction of the absorbable ligature, it has been entirely discarded in surgical practice. This ligature, consisting of catgut, prepared tendon, or silkworm gut, has the peculiarity that when placed around an artery and imbedded in the surrounding textures, it gradually becomes absorbed by the tissues around it, and does not require removal from the wound as was the case with the older silk or thread ligature.

Venous bleeding is recognised by the dark colour of the blood, and its continuous flow. Pressure is generally found sufficient to arrest it, and it should be applied *directly* over the wounded part. In this case, pressure higher up the limb only does harm, by retarding the return flow of the Circulation (q.v.), and thereby increasing the bleeding from the injured vein. It is hence very important to distinguish venous bleeding from that which occurs from arteries. In both, direct pressure on the bleeding point is the first imperative indication for treatment; in venous bleeding this suffices for the permanent arrest of the bleeding in most cases; in arterial bleeding it must be supplemented by one of the methods already described.

When a very large vein is divided, its two ends must be ligatured; if it be only partially severed, the surgeon can sew up the wound in its walls in many cases, and its function as an organ of the circulation is thus preserved.

Oozing from cut surfaces partakes more of the characters of venous than of arterial bleeding, and is called *capillary*—arising from the severance of vessels fine as a hair—as there is no vessel sufficiently large to demand the application of a ligature. The actual cautery or cold may be used, or one of the many styptics—e.g. perchloride of iron—may be specially recommended; it may be applied on lint or a sponge; or local astringents, such as alum and tannin. There are also puff-ball, felt, &c., which act mechanically, and owe their reputation chiefly to the pressure used in their application. The best remedy for this type of bleeding is the application of a steady stream of *very hot* water to the injured surface. If continuously applied at as high a temperature as the patient can possibly endure, rapid cessation of the oozing takes place. Some persons have a congenital tendency to bleed (the hemorrhagic diathesis); if such a one have a trifling cut, or have a tooth pulled, he bleeds perhaps to death. A prudent surgeon will not perform cutting operations on one of a hemorrhagic family unless unavoidable.

Bleeding from the free surfaces of mucous membranes occurs when they are much congested. One may have fatal hemorrhage from the stomach, and yet no open vessel may be found after death, even on the most careful examination. In such a case, we must trust to cold and internal remedies, such as acetate of lead combined with opium, gallic and tannic acids, and the extract of Witch Hazel (*Hamamelis Virginica*).

In bleeding, of whatever kind, the posture of the patient is a matter of great importance. The recumbent position is associated with a diminished force of the circulation, and should therefore be adopted in all serious cases. If the bleeding occur in one of the limbs, the raising of the injured part

is in itself often sufficient to cut short the loss of blood, and this postural treatment should in all cases be employed in addition to the special local remedies above described.

Bleeding from internal organs, as the stomach or the lungs, is a very serious symptom, and must be immediately and carefully treated whenever it occurs. In any such case, the patient should be placed in the recumbent position in a cool airy room, the dress loosened to allow of cooling of the surfaces of the body, and the application of cold further effected by placing wet cloths over the chest and renewing them as soon as they become warm from contact with the body. All these remedies have the effect of slowing and reducing the strength of the circulation, and the patient therefore loses blood less rapidly. A table-spoonful of turpentine mixed with a little milk should be administered by the mouth at once, and another table-spoonful should be added to a jugful of boiling water, and the patient caused to inhale the vapour from it. This acts directly on the blood-vessels, tending to close them at the bleeding point. Keep the patient very quiet, and summon medical aid as speedily as possible.

BLOODLETTING (also called Bleeding or Depletion, and including Phlebotomy or Venesection, Arteriotomy, Wet-cupping, Leeching, and Scarification) is a method of relieving the human system in states of general or local plethora by the abstraction of blood. General plethora is best treated, according to this method, by withdrawing a considerable quantity of blood from the arteries (arteriotomy) or veins (venesection). Local engorgement, or *hyperæmia*, of a part is usually treated by abstracting blood from the smallest-sized vessels, or capillaries, present in the skin, by the methods of scarification or leeching. In these cases, the removal of blood from the superficial textures diverts the blood-stream in part from underlying tissues, and thus reduces the tendency to inflammatory action in the deeper structures. In general bloodletting the object is to reduce the strength of the blood-stream throughout the whole system, and thus to diminish the acuteness of feverish conditions. The most usually employed method of accomplishing this is by the opening of one of the superficial veins of the arm, and allowing a sufficient quantity of blood to escape from the blood-vessel thus operated upon. The vein chosen for the operation is generally one of those near the front of the elbow-joint, which can be conveniently reached in this region without disturbing the patient, and which can be closed after the operation by antiseptic dressings with the elbow bent when the operation is completed. In performing the operation, it is first essential to make the vein stand out clearly under the skin, and to do so it is necessary to remember that the veins return the blood from the extremities to the trunk, and therefore that pressure must be applied constricting the arm above the elbow, thus causing the veins to swell from retardation of the blood-flow within their walls. A bandage is thus tied tightly around the middle of the upper-arm, and, as a result of its action, the veins in front of the elbow-joint commence to swell and stand out as blue cords, distinctly to be seen through the delicate skin of this region. Selecting the largest of these swollen veins, the operator places his left thumb upon it immediately below the point where he desires to open it. This prevents any backward flow of the blood in the vein, and renders it yet more distinct at the point where it is to be opened. Now taking a sharp lancet in his right hand, the surgeon pushes its point steadily downwards through the skin into the blue column that marks the position of the vein, taking care, however, only to divide its outer wall and not to

transfix it completely. Having by this means made a slit about half an inch long in its outer wall, he withdraws the instrument and removes his left thumb from the vein. A steady flow of dark blood now takes place from the wound; this is received into a graduated glass vessel, by which the operator may gauge accurately the amount of blood removed. Should the flow of blood tend to diminish, the patient is requested to grasp some hard object tightly with the hand of the side operated upon, and an immediate increase will occur in the blood flowing from the wound. When a sufficiency of blood has been abstracted by this means, the operator places a large and firm pad of lint over the wounded vein, and bending the arm at the elbow to a right angle, bandages it firmly in that position, observing specially that the pad of lint is tightly pressed against the wound in the skin. When the bandaging is complete, and only then, the constricting band around the upper-arm may be removed. There is danger in removing it earlier, since air may enter at the wound in the vein; and, being sucked upwards into the chest, may cause sudden cessation of the heart's action, and a considerable risk of immediate death. On account of this danger, it is not advisable for unskilled persons to attempt the operation. When the bandage and pad are firmly applied, and when the constricting band is removed, the patient's arm is placed in a sling and kept at rest for a week, when the wound in the skin and the vein is generally healed, and the patient may be permitted to use his arm again without incurring any risk. In children the veins in the arm are too small to be operated on satisfactorily, hence the external jugular vein of the neck must be selected in such cases; but the danger of the entrance of air is still greater in this region than in the arm; the operation should therefore be reserved for very urgent cases, and only performed with the utmost caution. The amount of blood actually abstracted in bloodletting must depend on the age of the patient and the nature of the case. The operation would be scarcely necessary if less than a quarter of a pint is to be removed, and it is now rare to remove more than one pint at one operation, however severe the case in which it is employed. For the methods and effects of local bloodletting, see **CUPPING** and **LEECH**. For the bleeding of animals, see **PHLEBOTOMY**.

Bleek, **FRIEDRICH**, a German biblical critic, born 4th July 1793 at Ahrensböken in Holstein, studied theology first at Kiel, and afterwards under De Wette, Neander, and Schleiermacher, at Berlin, where he was appointed in 1818 a university tutor, and in 1823 an extraordinary professor of Theology. In 1829 he was called to Bonn, and he remained there till his death, 27th February 1859. Bleek's chief work was his commentary on *Hebrews*, which theologians so different as De Wette and Delitzsch have ranked among the first exegetical works of its century. Schleiermacher declared that the '*Charisma* of Biblical Introduction' had been specially given to Bleek; his *Einleitung in das Alte Testament* (1860) and his *Einleitung in das Neue Testament* (1862) were translated into English by Venables and Urwick respectively, and re-edited (1886-93)—the former by Wellhausen and the latter by Mangold. Solid unpretentious learning and clear sober judgment equally distinguish these and his other posthumous works, which include his *Synoptische Erklärung der drei ersten Evangelien* (2 vols. 1862), and lectures on *The Apocalypse* (1862), on *Colossians*, *Philemon*, and *Ephesians* (1865), and on *Hebrews* (1868).

Bleek, **WILHELM**, philologist, son of the preceding, born in Berlin, 8th March 1827, studied

there and at Bonn, and accompanied Baikie's Niger expedition in 1854, but was compelled by ill health to turn back at Fernando Po. He went with Bishop Colenso to Natal in 1855, and after eighteen months' study of the Kaffirs, settled at Cape Town, where in 1861 he was appointed keeper of the Grey Library. Here he was engaged chiefly in philological investigations until his death, 17th August 1875. His writings on Bushman and Hottentot philology and folklore are important, and the *Handbook of African, Australian, and Polynesian Philology* (3 vols. 1858-63) shows remarkable erudition; but his most valuable work is the unfinished *Comparative Grammar of South African Languages* (1862-69). In 1912 appeared *Specimens of Bushman Folklore*, by Bleek and Lloyd.

Bleiberg, a village in the Austrian land of Carinthia, 8 miles W. of Villach, in the valley of the Drave, near the celebrated Bleiberg (Lead Mountain), has lead and lead-pigment works.

Blekinge is a province in Sweden, also called after Carlskrona (q.v.).

Blende (Ger. *blenden*, 'to dazzle'), a name given to a number of minerals composed chiefly of sulphur and of certain metals, all or almost all of splendid lustre, at least in fractures and the faces of crystals. It is also very often popularly applied more exclusively to one of these minerals, to which alone, perhaps, it originally belonged, Zinc Blende, Garnet Blende, or Sphalerite; also called, according to its chemical composition, Sulphide of Zinc. Among English miners it is known as *Black Jack*. It is abundant both in crystalline and in sedimentary rocks in many parts of the world, and is often associated with Galena (q.v.), or Lead-glance. It contains about 66 parts of zinc and 33 of sulphur, and is used as an ore of Zinc (q.v.); but the reduction of it is attended with difficulty, which much diminishes its value. It is usually brown or black, sometimes red, yellow, or green. It occurs both massive and crystallised in rhomboidal dodecahedrons, octahedrons, and tetrahedrons. Macles, or twin crystals, are remarkably common. It is very brittle; before the blowpipe it decrepitates violently, but only fuses on thin edges.—Manganese Blende is a rare mineral composed of sulphur and manganese.—Antimony Blende, or Red Antimony, is also a rare mineral composed of sulphur and antimony.—Ruby Blende is a name sometimes limited to Pyrargyrite or Red Silver (see SILVER, ORES OF), sometimes extended as a sort of generic term to include a number of other minerals composed of sulphur and metals, among which are Cinnabar, Realgar, and Orpiment (q.v.).

Bléneau, a village in the French department of Yonne, 29 miles WSW. of Auxerre. Here Turenne gained a victory over the Prince de Condé in 1652.

Blenheim (Ger. *Blindheim*), a village of Bavaria, 23 miles NNW. of Augsburg, memorable in connection with Marlborough's great victory over the French and Bavarians, August 13, 1704. The battle, however, really took place at the neighbouring village of Höchstädt, and is known to the Germans by that name. France and Bavaria on the one hand stood opposed to England and Austria on the other. The French and Bavarian army consisted of 56,000 men, commanded by Tallard, Marsin, and the Elector of Bavaria. Opposed to it was an army of 52,000 men, under the command of Marlborough and Prince Eugene. The French and Bavarian generals had no idea that the allies would act on the offensive, and accordingly, when, about two o'clock in the morning, the line of the allies put itself in motion, they believed that it was about to retreat.

Even at seven o'clock, when the heads of the eight advancing columns became visible, Tallard regarded the whole proceeding as a stratagem to cover the retreat. When the mistake was discovered the army was hastily drawn up in battle-array, and fought with dauntless courage; but at five in the afternoon Marlborough broke through the line of battle, and won a victory most complete and decisive. The French and Bavarians lost between 30,000 and 40,000 in killed and wounded and prisoners, besides 120 pieces of cannon and 300 standards. The loss of the victors amounted to 5000 killed and 8000 wounded.—Near Blenheim the French defeated the Austrians in 1800.

Blenheim, capital of Marlborough district, New Zealand, near the coast, at the junction of two navigable rivers. There are gold-reefs in the neighbourhood, and the alluvial-mining is important. Pop. 4000.

Blenheim Dog, or MARLBOROUGH DOG, a small and very beautiful variety of spaniel, much resembling the King Charles breed in form and general appearance, but differing in the colour, which is white, with orange or flame-coloured markings. In weight it should not exceed 5 lb. The Blenheim spaniel is the *Pyrame* of Buffon. It derives its English name from Blenheim Park, in Oxfordshire, where the breed was a favourite one from the beginning of the 18th century.

Blenheim Park, near Woodstock, Oxfordshire, the seat of the Duke of Marlborough, erected at the public expense in the reign of Queen Anne as a testimony of gratitude to the victor of Blenheim. The sum, £500,000, that was voted for the purpose did not suffice for the completion of the work. The royal estate of Woodstock, in which it stands, was granted at the same time. The building was designed by Sir John Vanbrugh, and is a grand though heavy monument of his powers as an architect. The length of the principal front from wing to wing is 348 feet. The interior is proportionally magnificent, but its priceless collections of gems and paintings, and its library, were wholly or largely dispersed by auction between 1875 and 1886. Eleven of the pictures were offered to the nation for £350,000; amongst those acquired for the National Gallery was the *Ansdei Madonna* by Raphael, at a cost of £70,000. Among the objects of interest in the grounds are a triumphal arch, and a column 130 feet high, surmounted by a statue of Marlborough. An inscription on the pedestal, written by Bolingbroke, recites the public services of the hero. The park, 2700 acres in area and 12 miles in circuit, was laid out by 'Capability' Brown. Its trees are said to have been planted as the troops were ranged at Marlborough's victory; and a mighty bridge spans the rivulet Glyme, which then widens out into an artificial lake. See Marshall's *History of Woodstock* (Oxford, 1873).

Blennorrhœa (*blenna*, 'mucus,' *rheô*, 'I flow') is a medical term for an unusually copious discharge from any mucous membrane; but as it has been rather vaguely and inconsistently employed, most modern writers do not often make use of it. It has been used chiefly of discharges from the genito-urinary mucous membrane (see GONORRHOEA), from the conjunctiva, and the lachrymal sac (see EYE, DISEASES OF).

Blenny (*Blennius*), a genus of bony fishes, belonging to a large family (Blenniidae), in the division with spinous rays (*Acanthopterygii*). The family is characterised by Günther as follows: Body long, low, more or less cylindrical; naked, or with small scales; usually slimy. Dorsal fins extend along most of the back, often with prominent spinous rays. The hind fins are on the

throat, with few rays, and may be rudimentary or absent. The family includes 32 genera, with more than 200 species, widely distributed on the coasts of temperate and tropical seas, though some are found in brackish or even fresh water. The Sea-wolf or Cat-fish (*Anarrhichas*), with its formidable teeth; the slimy Butter-fish (*Centronotus*); the Viviparous Blenny (*Zoarces viviparus*), which brings forth its numerous young alive, and is popularly credited with being the parent of eels (Ger. *aalmutter*); the brightly coloured Salarias; and many other interesting forms, belong to this family. They are carnivorous, and somewhat indiscriminate in their diet. There are but few British representatives.

The blennies themselves have moderately elongated, short-tailed, naked bodies. There is usually a tentacle over each eye. There are about 40 species, which are usually marine, though several live temporarily or constantly in more or less fresh water. They swim in small shoals, and can live on the wet shore for a much longer time than the absence of a tide. They are said to use their ventral fins in clambering among the seaweed. They are all greedy flesh-eaters. *B. gattorugine* is rare on British coasts, but abundant farther south. The Butterfly Blenny (*B. ocellaris*) is a quaintly



The Butterfly Blenny (*Blennius ocellaris*).

pretty little fish about 3 inches long, with flowing spines, and with an eye-like spot on its dorsal fin. It is most frequent towards the Mediterranean. The Smooth Blenny or Shanny (*B. pholis*), with similar distribution, has the spinous portion of the dorsal fin separate from the soft portion, and is of an olive-green colour irregularly marked with black spots. Like some of the others, it has in both jaws a long curved tooth, which it is said to use in detaching molluscs. There is no eye-tentacle. This organ is best developed in *B. tentacularis*, a Mediterranean form. *B. vulgaris* is found in fresh water in Italy, and also in the Rhone. The blennies are but rarely used as food, but their activity and hardness make them favourite inmates of aquaria. See Günther's *Introduction to the Study of Fishes*.

Blessing. See BENEDICTION.

Blessington, MARGUERITE, COUNTESS OF, was born September 1, 1789, at Knockbrit, near Clonmel, Tipperary, where her father, Edmund Power, owned a small property. At the early age of fourteen she was forced into marrying a worthless Captain Farmer. She quitted him in three months' time, and in 1818, shortly after his death, married Charles Gardiner, Earl of Blessington. With him in 1822 she set out on a long tour on the Continent, where, as well as in London, she gathered around her all the most distinguished men of the time. In Genoa she formed an intellectual friendship with Lord Byron; afterwards she resided in

Paris, until the death of her husband in 1829. He left her a large fortune; and she held a little court of her own at her Kensington mansion, Gore House, Kensington, her celebrated soirées being frequented by many of her distinguished contemporaries. Her connection with Count d'Orsay (q.v.), which dated from 1822, placed her in an equivocal position as regards society, and her lavish expenditure overwhelmed her in debt, though for nearly twenty years she was making an extra income of more than £2000 per annum as author of a dozen most trashy novels. She was the authoress of *The Idler in France*, *The Idler in Italy*, and *Conversations with Lord Byron* (1834; new ed. 1894), which placed the poet in a more favourable light before his countrymen. At length in April 1849 she and D'Orsay had to flee from their creditors to Paris, and there on 4th June she died of apoplexy. See her *Life* by Madden (3 vols. 1855), and by Molloy (1896).

Bletchingley, an ancient town of Surrey, 5 miles NE. of Reigate, which till 1832 returned two members to parliament, though now a mere village. In the neighbourhood fuller's-earth is got.

Bletchley, a railway junction in Buckinghamshire, 47 miles NW. of London, 31 NE. of Oxford, and 45 SW. of Cambridge.

Blets, rotten spots in apples, pears, medlars, and other fruits.—*Bletting* is the first stage in the rotting of such fruits when the consistency of the fruit has altered, and the colour changed to brown, but before actual putrefaction has set in. The medlar is eaten in this state. See FRUIT.

Blewfields, BLUEFIELDS, ESCONDIDA, or RIO DEL DESASTRE, a river of the former Mosquito Territory, in Nicaragua, which, after a course of several hundred miles to the east, enters the Caribbean Sea in 12° N. lat. and 83° W. long. At its mouth is a good harbour, with a town—all named from a buccaneer captain, Blewfields.

Blicher, STEEN STEENSEN, Danish poet and novelist, born 11th October 1782, at Vium, a village of Viborg; studied at Copenhagen, became in 1819 pastor at Thorning, and in 1826 at Spendrup, in Jutland. Here he died, 26th March 1848. He was long known only as the successful translator of Ossian (1807-9), but his *Sneeklokken* (1826) and his *Jydske Romanzer* soon became widely popular, and were eclipsed by his *Nationalnoveller*. His poems are thoughtful, tender, and eminently national; and he left a humorous autobiography.

Blickling Homilies, Anglo-Saxon sermons (containing much legend) edited by Dr Richard Morris for the Early English Text Society in 1874, from the MS. at Blickling Hall near Aylsham in N. Norfolk.

Blida, a thriving town of Algeria, 32 miles SW. of Algiers by rail, which was ceded to France in 1837. The orange orchards produce 50 million fruits a year, which are mostly exported to France; and there is some trade in cotton, raisins, grain, tobacco, copper, and cork-wood. It suffered from earthquake in 1825 and 1867. Pop. (commune) 36,000.

Bligh, WILLIAM, an English admiral, born of an old Cornish family in 1753 or 1754, and celebrated in connection with the mutiny of the *Bounty*. He sailed under Captain Cook in his second voyage round the world, and earned early a high reputation as a skilful seaman. In December 1787 he was sent by the British government, as commander of the ship *Bounty*, to Tahiti, which he reached about ten months later, to collect plants of the bread-fruit tree with a view to their acclimatisation in the West India colonies. During their six months' stay on the island, his men had become

completely demoralised, and in a few weeks mutinied under the overbearing temper and harsh treatment of their commander. On 28th April 1789, Bligh, with eighteen men, was cast adrift in an open boat but 23 feet long, with a small stock of provisions, and without a chart; while the mutineers turned their own course back to Tahiti, and ultimately settled on Pitcairn's Island. After almost incredible hardship, Bligh arrived at the island of Timor, near Java, on 14th June, having with infinite skill and courage sailed his frail craft for 3618 miles. 'Bread-fruit Bligh' was again sent to collect bread-fruit plants, but though he was more successful, little came of the scheme. In 1806 he became governor of New South Wales, it being thought that his stern discipline might put an end to the unruliness of the New South Wales Corps, which had been a thorn in the side of previous governors. But he allowed personal dislikes to influence his conduct, and the corps mutinied against him early in 1808. He was kept under arrest in Sydney for a year, and then sent to England by way of Tasmania; at the end of 1809, however, he was by order of the British government reinstated for a day, and all official acts since the mutiny were cancelled. The officer who arrested him was tried in England and cashiered. Bligh, an admiral from 1811, died in London 7th December 1817. See Ida Lee, *Second Voyage of W. Bligh* (1920).

Blight, a diseased state of cultivated plants, especially cereals and grasses. The term has been very vaguely and variously used, having, in fact, been applied by agriculturists to almost every disease of plants in turn, however caused, especially when the plant dies before reaching maturity. See PLANTS (DISEASES OF), AMERICAN BLIGHT.

Blimbing, or BILIMBI (*Averrhoa Bilimbi*), an East Indian tree belonging to the Oxalidaceæ, cultivated in the Antilles for the sake of its wholesome and palatable fruit.

Blind. Blindness may arise from any cause intercepting the rays of light on their way to the optic nerve, or from disease of the optic nerve, or of that part of the brain connected with it. Blindness may vary in degree; it may exist from birth, or be the result of disease at any period of life. It may only be present during the day or the night, or a few weeks of the year, or it may be permanent. Only a few are born blind, although many lose their sight in infancy from preventable causes. One of the most frequent causes is ophthalmia neonatorum or the inflammation of the eyes of new-born babies, a disease which generally can be prevented, and always cured (see EYE). In almost all blind schools in England and the Continent, a third, and even more, of the pupils' blindness is caused by the neglect and unsuitable treatment of this disease. Eminent oculists state that half the blindness in Europe is due to this inflammation of the eyes of new-born babies. In 1914 ophthalmia neonatorum was made compulsorily notifiable in every sanitary district in England and Wales. Many become blind by accidents, smallpox, scarlet fever, measles, whooping-cough, or the various diseases of the Eye (q.v.).

The man who loses his sight after having had full use of it for years is profoundly to be pitied. Not merely has he lost that great gateway of knowledge, but it frequently happens that the loss of sight, for a time at least, shatters and enfeebles mental energy, and weakens the remaining senses and powers. Milton, blind himself, makes Samson say:

Now blind, disheartened, shamed, dishonoured, quelled,
To what can I be useful? wherein serve
My nation, and the work from heaven imposed?
But to sit idle on the household hearth,
A burdensome drone, to visitants a gaze,
Or pitied object.

The man born blind is in many ways still worse off: he cannot in the least imagine to himself what it is to be able to see; colour and visual form are unknown to him (see VISION). Locke's blind man who imagined that 'scarlet was like the sound of a trumpet,' made but a very random shot. Nor is it true that the blind man's other senses are preternaturally acute, and that blind people are always good musicians. A blind boy, under proper training, can indeed have his senses of touch and hearing developed to a state of exceeding acuteness, though they can never make up for the lost faculty. A blind boy who can read with the first finger of each hand, will be as unable as the seeing to use the other fingers for reading, unless he has practised with them. Without careful training and persevering industry, the blind cannot attain even creditable proficiency in music. Amongst blind men and women, some of them blind from infancy, who have more or less completely triumphed over their disadvantages or been otherwise famous may be named Homer (possibly); Blind Harry; John Milton; the Cambridge professor, Nicholas Saunderson (q.v.); Dr Blacklock; Leonard Euler; John Metcalf of Knaresborough, road surveyor (blind from six years of age); Holman, the blind traveller; Huber, the naturalist; Prescott, the historian; Rev. George Matheson, D.D.; Rev. W. H. Milburn, chaplain of the United States Senate; John Stanley, Mus. Doc. Oxon; Edward Rushton; Maria Thérèse von Paradis; Elizabeth Gilbert; Louis Braille; Sir George Macfarren; Dr Wm. Moon; Dr T. R. Armitage; Sir Francis J. Campbell; Professor Fawcett; and Sir Arthur Pearson. The blind have at various times suffered under special legal disabilities—for example, as to acting as witnesses and as to succession to fiefs and thrones; by the canon law a blind man was disqualified for holy orders.

At successive censuses the number of totally blind persons in the United Kingdom was:

	1851.	1861.	1871.	1881.	1891.	1901.	1911.
England and Wales	18,306	19,352	21,590	22,832	23,467	25,317	26,336
Scotland	3,010	2,820	3,019	3,158	2,797	3,253	3,317
Ireland	7,587	6,879	6,347	6,111	5,341	4,253	4,312

At the same dates the number of the general population to each blind person was:

	1851.	1861.	1871.	1881.	1891.	1901.	1911.
England and Wales	979	1087	1052	1138	1236	1285	1370
Scotland	1065	1090	1112	1182	1439	1375	1435
Ireland	864	843	852	847	881	1045	1018

The great number of aged blind in Ireland is doubtless due to an ophthalmic epidemic during the Irish famine.

The decrease may be fairly attributed to the progressive improvement in surgical treatment of affections of the eyes, to the diminished prevalence of such diseases as smallpox, to which a considerable amount of blindness was formerly due, and the lesser prevalence or more efficient treatment of purulent ophthalmia, and other infantile maladies which result in blindness. Another cause of decrease is probably the improvement of the health of the community due to better sanitation.

In the United States in 1910 the enumerators reported approximately 61,500 as blind, but from registers compiled in the different states it is estimated that 100,000 is a nearer approximation.

Institutions.—The first institution for the blind of which we have any record was a hospital merely—namely, that founded by St Louis at Paris in 1260 for 300 blind persons. The common legend is that

he founded it as an asylum for his soldiers returning from the crusades, but the statutes of the founder are preserved, and no mention is made of crusaders. There have been many such hospitals, where no attempt at education was made. The first book calling attention to the condition of the blind was published in Italy in 1646, and from that time there was increasing interest in the subject. Jacques Bernouilli (q.v.), in 1676, taught a blind girl several branches of science, and also how to write; and this led him to publish *A Method of Teaching Mathematics to the Blind*. But it was Valentin Haüy of Paris who, in 1784, made the first successful attempt to educate the blind. To him is due the honour of instituting a movement which has resulted in the establishment of institutions for education, and workshops for the training and employment of the blind in all civilised countries. Before the end of the century the following institutions were opened in this country: School for the Indigent Blind, Liverpool, 1791; Royal Blind Asylum and School, Edinburgh, 1793; School for the Blind, Bristol, 1793; School for the Indigent Blind, London, 1799. Since the beginning of the 19th century many institutions for the blind have been opened in the United Kingdom.

School Boards and Local Education Authorities.—The School Board of Glasgow was the first to take up this work, but London subsequently took the lead, and adopted a comprehensive and systematic plan. The blind children attended board schools, but received special instruction at thirty centres. The Report of the Royal Commission on the Blind (1889) led to the passing in 1893 of an Elementary Education (Blind and Deaf Children) Act, under which their education became compulsory between the ages of five and sixteen. The Local Education Authorities were made responsible for the provision of instruction up to the age of sixteen, and annual grants were contributed by the Board of Education. Similar provision is made for Scotland. This act led to an increase in the number of residential schools, and the establishment of day schools for blind children in some of the large towns. Separate classes for children suffering from a high degree of myopia have also been formed. The Blind Persons Act of 1920 requires education authorities to provide for the technical training of the blind.

Schools, Workshops, and Homes.—When the institutions for the blind were first established in the United Kingdom, they were often a combination of school, workshop, and asylum. This association of the youthful and adult blind is most undesirable, and a notable change has been their separation. In some instances the schools have been removed from crowded city quarters to the country. Under the Blind Persons Act local authorities must make arrangements for the welfare of the blind, and may provide workshops, hostels, &c.

Home-teaching Societies.—There are home-teaching societies in all the large towns in the United Kingdom; and the blind, even in country districts, are visited. Most of these societies assist in other ways. The Indigent Blind Visiting Society, founded in 1834, visits, educates, and relieves the blind at their own homes, independently of asylums. It is the great missionary society to the blind of London.

Pensions.—In the United Kingdom the principal societies that help the blind by granting pensions are Hetherington's, Day's, the Clothworkers', the Cordwainers', Royal Blind Pension Society, and Indigent Blind Visiting Society. The Gardner Trust administers the income of £300,000 left by Mr Henry Gardner in 1879. It is used for instruction in music, for pensions, and for grants for special purposes. By the Act of 1920 Old Age Pensions begin for the blind at fifty.

Unions of Institutions, Societies, and Agencies

for the Blind.—Unions covering the whole of England and Wales have been formed to organise, co-ordinate, and extend work on behalf of the blind; to stimulate the prevention of blindness; to encourage the after-care of pupils leaving institutions; and to promote employment. A 'union of unions,' consisting of elected representatives from each union, promotes unity of action. In Scotland the work of the unions is covered by home-teaching societies and outdoor missions.

National Institute for the Blind.—In 1868 Dr T. R. Armitage, aware of the great improvements which had been made on the Continent and in America, founded the British and Foreign Blind Association to promote the education and employment of the blind, by ascertaining what had been done in this and other countries, and by attempting to bring about harmony of action between existing schools and institutions. The association soon gained information through its corresponding members of what was being done abroad, and published a report. The executive council of the association endeavoured to induce the various institutions to adopt the best methods and systems of education, and was indefatigable in its efforts to improve and cheapen the apparatus, books, maps, &c. used by the blind. Under Mr Henry Stainsby, secretary-general from 1908, many important improvements have been introduced, notably in the method of embossing and printing books in the Braille type. Mr H. M. Taylor established a fund for the production of scientific books. In 1914 the Armitage Hall, part of a new commodious building, was opened. At that time the name of the association was changed to the National Institute for the Blind. Sir C. Arthur Pearson, president and treasurer, raised a large endowment fund for printing books in embossed type.

Departmental Committee.—In 1914 a Departmental Committee was appointed to consider the condition of the blind in the United Kingdom, the means available for their industrial and professional training, and their assistance. The Great War had greatly augmented the number of the blind when the committee reported in 1917. It recommended more active intervention of the state, by means of a special department under the Ministry of Health, to secure central control, organisation, and assistance for existing voluntary agencies, and additional assistance for the blind. It drew attention to the very adequate provision for blinded soldiers and sailors at St Dunstan's Hostel, and to the National Institute's care for the future welfare of the inmates. In conclusion, it referred to 'the extremely hopeful nature of the problem,' and the probability of gradual and permanent reduction in the number of the blind. Advisory committees were set up, which co-operated with the National Institute and government departments. The Blind Persons Act of 1920 was the outcome of this policy.

United States.—In the United States every blind child has a right to be educated at the expense of the state. Some of the best institutions are, however, founded and partly maintained by private benevolence. In a number of the states permanent commissions on the blind have been appointed, whose efforts have been chiefly directed to registering the adult blind, and as far as possible providing employment for them. They have started an active propaganda for the prevention of blindness, and a national association for the 'Conservation of Eyesight' has been formed. Its aims are: (1) the prevention of infantile blindness; (2) the prevention of blindness from industrial and other accidents; (3) the conservation of vision through improved hygiene during school-life and in industrial occupations. The Russell Sage Foundation has made an appropriation for this field of work.

The following table furnishes statistics of other countries :

	Number of Blind.
Australia (1901).....	2,784
Belgium (1910).....	3,223
Bulgaria (1905).....	5,319
Canada (1910).....	3,238
Chile (1901).....	2,601
Denmark (1911).....	1,395
Egypt (1907).....	148,280
In one eye.....	363,702
France (approx.).....	32,000
Finland (1900).....	3,229
German Empire (approx.).....	35,000
Prussia (1910).....	20,953
Holland (1909).....	2,710
India, British (1911).....	443,653
Italy (approx.).....	21,500
Norway (1910).....	2,097
New Zealand (1916).....	566
Portugal (1911).....	7,916
In one eye.....	10,814
Russia.....	247,900
South Africa (1910).....	6,550
Europeans.....	976
Sweden (1900).....	3,413
Switzerland.....	2,107
United States (1910), totally blind (approx.)..	61,500

In 1784 Valentin Haüy commenced the first printing in raised characters for the blind, and founded the Institution Nationale des Jeunes Aveugles, which was the first, and still holds its place among the best-managed schools for the blind in the Old and New Worlds. The character he chose was the Italic, or written form of the Roman letter. Founts of types were cast and books printed; and having been approved by the Academy of Sciences, and exhibited before the royal family at Versailles, the art created at the time a great sensation.

Gall's Type.—James Gall of Edinburgh saw specimens of Parisian books in 1826, and was deeply impressed with the importance of putting the Bible into the hands of the blind to employ their vacant hours. Being himself a printer and publisher, he resolved to improve the alphabet so as to make it more tangible. In 1827, after much study and many experiments, Gall printed his 'first book' for teaching the blind to read, in a triangular modification of the common alphabet, of which the following is a specimen :

BEHOLD THE LAMB OF GOD

This was followed by other little volumes, including a series of Scripture statements and a condensed epitome of Old Testament history. These were received with so much favour that in 1829 he issued a prospectus for the publication of the Gospel of St John, at one guinea, which was to pay not only for the copies, but preliminary expenses. This work was printed in 1832, but was not published until 1834. In 1832 the Scottish Society of Arts offered a gold medal, value £20, for the best alphabet for the blind. The award was not made till 1837. Sixteen arbitrary alphabets had been sent in, all of which were rejected, and the prize was awarded to a Dr Fry of London, who had suggested the use of Roman capitals, which were introduced in America in 1834. Great interest began to be excited throughout Britain, and extended even to foreign countries. Abbé Carton was sent by the Belgian government to visit Gall's establishment, and returned to set up a printing-press in Brussels. Gall was anxious to improve the printing and lessen the cost; the most important improvement consisted in the use of serrated types, by which the letters were formed of dots instead of lines, thus :

BEhold the Lamb of God

In 1836 he offered to print in the improved type as an ordinary business transaction, without subscriptions or donations. Of this offer the London Sunday School Union, the Religious Tract Society, and the British and Foreign Bible Society availed themselves in 1837; and in 1838 he printed for the last mentioned the Gospel of St Luke and the Acts of the Apostles.

As the institutions for the blind in those days 'had not hitherto,' as they expressed it, 'patronised any device of this kind,' Gall had to contend with all the apathy and incredulity which every new thing has to encounter. But now the tide had turned; readers were multiplying over the country, schools for the blind were beginning to be formed, the institutions abroad had all 'patronised the device,' and printing-presses were busy both in America and on the Continent; so that when the Sunday School Union, the London Tract Society, and the British and Foreign Bible Society began to publish class-books, tracts, and Bibles for the blind, they all became convinced of its importance.

Howe's or Boston.—Dr Howe, from Boston, visited Scotland, and having received from Gall all the information which he could supply, established on his return to America a printing-press in the Perkins Institution. In 1834 he published the Acts of the Apostles, and completed the New Testament in 1836. About the same time Friedlander of Philadelphia published the Gospel of St Mark. Friedlander unfortunately adopted the capital alphabet. Dr Howe, on the contrary, had adopted an angular modification of the common alphabet, similar to, but much smaller than, Gall's, and with that printed the whole Bible, besides an ever-increasing number of other volumes in all departments. The following is a specimen :

behold the lamb of God

For many years Howe supplied books for all the institutions in the United States.

Alston's.—John Alston of Glasgow, who established a printing-press in the Blind Asylum, of which he was treasurer, printed in 1837 the Gospel of St Mark in the same type in which (unknown to him) it had been printed in 1834 by Friedlander. Through his influence it was at once adopted in the other institutions throughout the kingdom; and, having thrown himself with much enthusiasm into the work, he very soon raised funds by which he completed the New Testament in 1838, and the whole Bible in 1840. To him, therefore, belongs the honour of having printed the first complete Bible for the blind in any language, because Howe, although he commenced the work earlier, did not finish it till 1842. The effect was immediate and decisive; rivalry was extinguished, hundreds of the blind were brought under instruction, and reading was thenceforth acknowledged to be a necessary department of the education of the blind. Alston, encouraged by the decision of the Scottish Society of Arts, which he himself helped to influence, made a fatal error in adopting Roman capitals. Reaction very soon took place, the blind themselves being the first to rebel. The want of sufficient legibility was, in their judgment, a fatal objection, and outweighed all other considerations. Even the large amount of money that had been expended, and the extensive libraries that had been formed through Alston's energetic labours, they were prepared to sacrifice, in order to obtain books which they could read with ease.

Lucas's.—In 1838 Lucas of Bristol introduced an ingenious shorthand, and for many years it was used by the London Society for Teaching the Blind.

to Read. The characters are arbitrary, consisting mainly of lines with or without a dot at one end.

Frere's.—Frere also introduced his shorthand system about 1838. The embossed characters were only an application of his phonetic system for the seeing, which he hoped would become general. His characters consist of straight lines, half-circles, hooked lines, and angles of 45 degrees, together with a hollow and solid circle. Frere employed 'return' lines; that is to say, the lines read 'boustrophedon,' the letters themselves being reversed in the return lines. He devised a cheap and very ingenious method of setting up and stereotyping his books. The letters, formed of copper wire, are laid on a tin plate, previously washed over with a solution of zinc; when heat is applied to the under-surface, the letter becomes soldered on to the plate, and such plates produce extremely good printing. Both Moon and Lucas adopted this system of stereotyping.

Moon's.—Dr Moon of Brighton, whose system is used more than any other by the older blind throughout the country, adopted an arbitrary alphabet, some of the characters resembling or suggesting the letters which they represent. He also adopted Frere's return lines, but did not reverse the letters.

Braille.—Towards the middle of the 19th century the intelligent blind in all parts of the world began a very earnest protest against the various line-types, which had been arranged with as much regard to the seeing as the blind. In a short time the question became one of dots *versus* lines. It was then that the great invention of Louis Braille was recognised. He had published a system in 1829, and fully developed it in 1834. His blind friends and co-workers immediately recognised its superiority over the Roman letter, but the school authorities of the Institution Nationale des Jeunes Aveugles would not change the old system. It was not officially adopted in Paris until 1854, two years after the death of its inventor.

Louis Braille (1809-52) was born at Coupvray, about 23 miles from Paris. He became blind through an accident at the age of three. In 1819

too long vertically to be covered with the finger. Braille worked upon it until he devised the simple and beautiful system which bears his name. His signs are arbitrary, and consist of varying combinations of six points placed in an oblong. There are sixty-three distinguishable combinations of these, so that after providing an alphabet there remain signs for punctuation, contractions, &c.

The group of six dots, which is the largest number of points that any letter can consist of, is divided into upper, middle, and lower pairs. The first ten letters, from *a* to *j*, exhaust all possible combinations of the upper and middle points. The next ten, from *k* to *t*, are formed from the first by adding a lower back point to each. Thus, *a* becomes *k*, *b* becomes *l*, &c. The third row is similarly formed by adding two lower points. Thus, *a* becomes *u*, *b* becomes *v*, &c.

The fourth row of letters is formed from the first by adding a lower front point to each of the first row. The only letter of the ordinary alphabet in this row is *w*, which is derived from *j* by adding a lower front point. This is a consequence of the French origin of the system.

In Egypt the Koran has been printed in Braille type, and a blind person can earn a good livelihood by reading it at funerals and on other occasions. Mr Murray, a Scottish missionary, ingeniously adapted the Braille system for printing Chinese.

Braille Writing-frame.—For writing, a frame is used consisting of a grooved metal bed, containing ten grooves to the inch; over this is fitted a brass guide, punched with oblong holes, whose vertical diameter is $\frac{3}{8}$ ths of an inch, while the horizontal diameter is $\frac{1}{8}$ ths. This perforated guide is fixed into a light wooden frame, like the frame of a slate, which is attached to the grooved metal bed by hinges. The paper is introduced between the frame and the grooved bed. The instrument for writing is a blunt awl, which carries a little cap of paper before it into the grooves of the bed, thereby producing a series of little pits on the side next the writer. When the paper is taken out and turned over, little prominences are felt corresponding to the pits on the other side. The reading is performed from left to right, consequently the writing is from right to left; but this reversal presents no practical difficulty as soon as the pupil has caught the idea that in reading and writing alike he has to go forwards. The brass guide has a double row of openings, which enables the writer to write two lines; when these are written he shifts his guide downwards until two little pins, which project from the under surface at its ends, drop into corresponding holes of the frame, when the writer writes two more lines; and this operation is repeated until he arrives at the bottom of the page. This description applies to the writing-frame used in France and most parts of the continent of Europe.

The English frame is somewhat different. In it the bed is not grooved, but is marked by groups of little pits, each group consisting of six. These are arranged in two parallel lines, and the guide is hinged on this bed in such a way that when the two are locked the openings in the guide correspond exactly to the pits in the bed. When the first two lines have been written, the guide and bed travel as one piece down the board, which is so arranged as to give the right distances between the lines. Each line is separated from the next by a wide interval, which greatly facilitates reading; when the first page has been written the paper is reversed, and the lines of the second page are written in the intervals between those of the first. A simple mechanical arrangement enables a blind person to do this with ease and certainty. This interlined writing not only makes the writing far more legible than that produced in the original

A	B	C	D	E	F	G	H	I	J
••	••	••	••	••	••	••	••	••	••
••	••	••	••	••	••	••	••	••	••
K	L	M	N	O	P	Q	R	S	T
••	••	••	••	••	••	••	••	••	••
••	••	••	••	••	••	••	••	••	••
U	V	X	Y	Z	and	for	of	the	with
••	••	••	••	••	••	••	••	••	••
••	••	••	••	••	••	••	••	••	••
ch	gh	sh	th	wh	ed	er	ou	ow	will
••	••	••	••	••	••	••	••	••	••
••	••	••	••	••	••	••	••	••	••

THE BRAILLE ALPHABET, WITH CONTRACTIONS.

The large dots represent the raised points of the Braille letter; the small simply serve to indicate their position in the group of six.

The signs of the 3d, 3d, and 4th lines are formed from those of the 1st by the addition of lower dots.

he became a pupil of the Institution Nationale des Jeunes Aveugles at Paris. In 1826 he was elected a teacher at the institution, where he had distinguished himself as a pupil. As pupil and as teacher he laboured to invent a system which the blind could not only read, but write in relief. He had been trained as a boy to read the line-type; after examining all systems, including arbitrary characters, he became convinced that the one best adapted to reading and writing was Barbier's. Barbier's letter contained six points, but was

French frame, but also effects a saving of space amounting to about 20 per cent.'

Soon after the founding of the British and Foreign Blind Association, Dr Armitage, the indefatigable honorary secretary, said: 'After the most determined opposition, the Braille system, which is the foundation of all real education for the blind, has been pretty generally adopted by the schools of the United Kingdom, and the work of the association

has, to a great extent, contributed to produce the same result in Germany.'

New York Point.—A modification of the Braille, known as New York Point, has been adopted in the United States. The long diameter of the full letter of six points is horizontal instead of vertical (: :), the letters recurring most frequently being represented by the smallest number of points.

American or Modified Braille.—A modification

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
LUCAS	•	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	
FRERE	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	
MOON	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	
NEW YORK	•	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	⠠	

ADDITIONAL SIGNS.

Short.

	ll	ss	ff	th	sh	ph	ch	ng	wh	gh	ou	oo	ah	or	oi	ing	and	of	that	the	a	e	i	o	u
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ALPHABETS USED BY THE BLIND.

of English Braille is used also in nearly half the schools for the blind of the United States. In this system also the signs are rearranged so that the letters of the alphabet recurring most frequently are represented by characters containing the fewest dots, and different contractions have been adopted.

Braille Musical Notation.—Braille furnishes a musical notation as easy to learn as the ordinary staff notation. Any music whatever can be written. In instrumental music a serious disadvantage arises from the fact that the blind performer has both to read and play with his hands; the usual plan is to read with one hand and play with the other, until the music is committed to memory. As care is taken not to reproduce what is already in print in other countries, blind musicians have now a very large and varied library, which is daily extending.

A Uniform Type.—At a conference of the America Association of Workers for the Blind held at Saginaw, Michigan, in 1905, it was felt the time had come when a determined effort should be made by the blind themselves to settle this vexed question of types, and save the waste of money which arises from embossing the same book in several different systems. A committee of representative blind men was appointed to examine the different systems of dotted type, and try to determine what are the fundamental principles which must underlie an embossed system in order that it may best accomplish its mission, to devise a code based upon them, and to secure its general adoption. It is confidently believed that a system devised in accordance with the finding of the committee will be adopted in all the schools for the blind in America. By consultation with workers for the blind in Great Britain, it is hoped to secure their co-operation in the adoption of one uniform system for the English-speaking blind of the world.

Printing.—The printing for the English-speaking

blind is done principally by the American Printing House for the Blind, Louisville, Kentucky, U.S.A.; the Howe Memorial Press, Perkins Institution for the Blind, Boston, U.S.A.; Dr Moon's Printing Establishment, Brighton; and the National Institute for the Blind. The American Printing House has a subsidy from the American government, and the institutions in the United States have the right to order books in any type. Embossed books are produced in various ways, in France generally from movable type. In America the printing was formerly done from electro-plates or stereotype-plates, made from forms of movable type set up by hand. For many years the British and Foreign Blind Association printed from brass plates. A sheet of brass folded upon itself was placed in a strong frame and embossed by means of a punch and hammer, in a similar way to that in which a style would be used in writing a single sheet of paper. The first complete copy of the English Bible in Braille, requiring 39 large foolscap volumes, was produced between 1877 and 1890, and every dot of the 6000 sheets, punched by hand, was the labour of one man. The invention of the stereotypemaker in 1893, by Mr Frank Hall, late superintendent of the School for the Blind, Illinois, U.S.A., has revolutionised the method of preparing embossed plates. This machine, which punches at a stroke characters composed of several dots, can be driven by electric power, and thus produces quickly embossed plates ready for printing. It has led to a greatly increased supply of books, as all the large schools in Great Britain and America print books and music for their own use. At the National Institute improved printing-presses driven by electric power have been set up, on which the embossed plates open and shut automatically to receive the paper; by the new method 6000 single pages can be printed in an hour, against 320 by the old press.

Formerly each sheet of paper was damped before printing, and the drying process was cumbersome and lengthy. The books are now printed on specially made sulphite paper, which softens as it comes in contact with electrically-heated plates, and as quickly hardens when it leaves them.

Libraries, &c.—Embossed books are now placed on shelves of the public libraries in many large cities of Great Britain and the United States. The public library at Oxford has many volumes of classical and standard works for the use of the university students. The Incorporated National Lending Library, London, was founded in 1882. Books are forwarded to all parts of the United Kingdom at a reduced rate of postage. In the United States, Canada, and Australia such books are carried free of charge.

Apparatus.—By means of the optophone the blind can read ordinary type by ear. Writing-frames are of many patterns. Paper with raised lines and corrugated cardboard are used for correspondence, but any of the typewriters constructed for the seeing can be used with equal facility by the blind. A Braille code of shorthand was elaborated at the Birmingham institution, and a machine for writing it was invented by Messrs. Stainsly & Wayne of that city. A knowledge of this code and the use of this machine enable blind persons to secure positions as shorthand typists. There are a number of machines for writing Braille. For working arithmetical sums many ciphering-boards have been constructed, but the best is the octagonal board introduced by the Rev. William Taylor of Worcester. For school purposes good and very cheap maps are produced by the National Institute, and by Herr Kunz at Illzach, Alsace. Mr Frank Hall also invented a machine for map-making, which is used in some schools for the blind.

Trades.—The handicrafts which are usually pursued in the principal workshops of the United Kingdom are the making of baskets, brushes, brooms, bedding, upholstery, wire-work, boot and shoe repairing, making of mats, ship-fenders, ropes, sacks, chair-caning, wood-chopping, &c.; for girls, typewriting, massage, the making of fancy baskets, brushes, chair-caning, hand and machine sewing, knitting, netting, crocheting, &c. Of all trades, pianoforte-tuning is the best; but the blind can only succeed as pianoforte-tuners when they are first-class workmen.

In the United States broom-making, under favourable conditions, proves very remunerative. The Germans have not adopted our workshop system for the blind, but the best institutions, especially of Saxony, continue to keep a methodical supervision over their pupils, even in the country districts, after they have left the institutions. It is claimed that by this system a much larger proportion of the blind become independent members of society. Active friends of the blind in all countries would do well to acquaint themselves with the details of the Saxony system.

Professions.—A considerable number of blind persons have passed through the leading universities of Britain and other countries, and have won by their talents and energy honourable positions in the church, medicine, law, politics, and commerce. There is a Fawcett Memorial Scholarship tenable by blind persons for four years at any of the universities of the United Kingdom, including women's colleges. Four university scholarships are granted by the Gardner Trust. In some parts of the United States a government grant is made to defray the expense of a sighted reader for blind students at the university.

Music.—Music in its various branches offers the best and most lucrative employment for those among the blind who, from an early age, can have

suitable educational privileges. The Royal Normal College and Academy of Music for the Blind has shown by practical results what is possible in the profession of music. The education in the college is not limited to music: to a casual observer it would seem that music occupied almost a secondary place. The first aim is mainly character, healthy bodies, well-cultivated and active minds, and prompt, business-like habits, which qualify its pupils for practical life. The pupils are taught swimming, skating, rowing, cycling, gymnastics, military drill, and in the season a great variety of outdoor sports. The college embraces a preparatory school with classes in Kindergarten and modelling, a secondary school, a training-college, a technical school, and an academy of music.

See Haüy, *Essai sur l'Éducation des Aveugles* (1786); Guillié, *Instruction and Amusements of the Blind* (1819); Nieboquet, *Des Aveugles et de leur Éducation* (1837); St Marie, *Der Blinde und Seine Erziehung* (1868); Armitage, *The Education and Employment of the Blind* (1871); Levy, *Blindness and the Blind* (1872); Moon, *Light for the Blind* (1873); Rösner, *Das Unterrichts der Blinden* (1877); Anagnos, *The Education of the Blind* (Boston, U.S., 1882); Merle, Sengelmann, and Söder, *Das Blinden-, Taubstumm- und Idiotenwesen* (1887-90); the Report of the Royal Commission on the Blind, Deaf, and Mutes (4 vols. 1889); Mell, *Encyklopädisches Handbuch des Blindenwesens* (1899-1900); Sizeranne, *The Blind in Useful Avocations* (1881); *True Mission of Smaller Schools* (1884); *The Blind in France* (1885); *Two Years' Study and Work for the Blind* (1890); *The Blind as seen by a Blind Man* (1893; trans. Dr Park Lewis); Javal, *The Blind Man's World* (1904; trans. Ernest Thompson); Illingworth, *History of the Education of the Blind* (1910); Wilson, *Institutions, Societies, and Classes for the Blind in the United Kingdom* (1911); Best, *The Blind* (1919); Pearson, *Victory over Blindness* (1919) and *Conquest of Blindness* (1921); Reports of Conferences on the Blind; and the periodicals *Der Blindenfreund*, *Le Valentin Haüy*, *The Blind*, *Braille Review*, and *Outlook for the Blind*. And see EYE, VISION, BRAIN, SENSATION, COLOUR BLINDNESS.

Blind, KARL (1826-1907), author and revolutionist, was born at Mannheim, and studied law at Heidelberg. For his share in the risings in South Germany in 1848 he was sentenced to eight years' imprisonment, but liberated by the populace, found an asylum first in Belgium, and afterwards in England, where he took an active part in democratic propaganda. An enthusiastic advocate of German freedom and unity, he promoted the Sleswick-Holstein movement. As an author he wrote on politics, history, and mythology, including lives of Ledru-Rollin, Deák, Freiligrath; also volumes and magazine articles on such subjects as Fire Burial, Yggdrasil, Water Tales, Shetlandic and Welsh Folklore, The Siegfried Tale, and The New Conflict in Germany.—**MATHILDE BLIND** (1847-96), born the daughter of a banker at Mannheim, adopted her new name when Karl Blind married her mother, and became a champion of woman's rights and an accomplished and remarkable English poetess, amongst whose works *The Prophecy of St Oran*, *The Heather on Fire*, and *The Ascent of Man* were specially noteworthy.

Blind Fish. In the darkness of caves and of the great oceanic depths there are sometimes blind fishes. The eye may be visible but very small, or it may be quite hidden. There is usually a compensatory development of tactile organs. It has been shown by experiment on the goldfish that prolonged imprisonment in darkness is followed by deterioration of the eyes, but it is probable that the blindness of the cave-fishes and some deep-sea fishes has come about much more indirectly through germinal variations of a retrogressive kind. The American blind cave-fishes, such as *Amblyopsis*, have near relatives in exposed fresh-water streams; the Cuban blind cave-fishes, *Lucifuga* and *Stygicola*, are of marine origin. In the sea the eyes of

fish are large in proportion to the depth inhabited, down to 200 fathoms; big eyes are needed to make the most of the scanty light. Below the light-limit large-eyed forms occur, probably utilising the gleams of phosphorescence, or small-eyed forms with greatly developed tactile organs. In the greatest depths, however, as the result of the *Challenger* Expedition demonstrated (see Günther's *Challenger Report on Fishes*), fishes with rudimentary eyes occur, as one would indeed expect. See CAVE ANIMALS, ENVIRONMENT, FISHES.

Blind-gut. See CÆCUM.

Blind Harry. See HARRY.

Blindheim. See BLENHEIM.

Blindness. See BLIND, COLOUR BLINDNESS.

Blindstory, another name for the Triforium (q.v.), so called as opposed to the Clearstory or Clerestory (q.v.) of a church.

Blind-worm, or SLOW-WORM (*Anguis fragilis*), a limbless lizard, in the Skink family. The form is worm-like, tapering slightly in the tail; only internal traces of limbs are present; the tail occupies about half the total length; the nostril is situated in a shield; the eyes are small but quite serviceable; the eyelids are scaly and movable; the earhole very small and hidden; the teeth borne on the jaws are long, pointed, and directed backwards; the tongue is scaly in front, with slender warts behind; the scales are smooth, and those of the head very distinctive. The colour varies considerably with age; the young are whitish above with



Blind-worm.

a median black stripe, but black on the sides and below; the adults are brownish above and black below, often relieved by longitudinal lines. The full size is about a foot, about half of which goes to the tail, but large specimens may measure a foot and a half or more. The blind-worms are shy animals, living among bushes, and coming out at night in search of earth-worms and white slugs. They give a feeble bite, but are perfectly harmless. So timid are they that they become rigid when caught, and in this state an attempt to bend the greatly contracted muscles results in a breakage. The body divides in two, as the specific title *fragilis* implies. The young are born alive in midsummer to the number of 8 to 26. In winter they hibernate in holes in the ground, not alone, however, but in companies of two dozen or so. The blind-worms are found all over Europe, except in Sardinia and the northern regions, and are also known in North Africa and Western Asia. They appear to be hardy animals, and have been found more than 3000 feet up the Alps. They occur, though not abundantly, in Britain. White of Selborne gives an interesting account of their habits. It need hardly be said that they have no special connection with serpents, though similarity of habit has come to be associated with a superficial external resemblance. As true lizards they must also be distinguished from the much rarer amphibian Cæcilia (q.v.), to

which—also neither worms nor blind—the name blind-worm is also sometimes applied.

Blister-beetle, a popular name for a number of beetles in a family of Coleoptera known as Vesicantia, or in two distinct families, Meloidæ and Cantharidæ. The name refers to the vesicating or blister-raising properties of their body-juice. The Spanish-fly and the Oil-beetle are familiar illustrations. As to the zoological characters of the family, the antennæ are usually 11-jointed, the head depressed with a narrow neck, the front shield narrower than the flexible wing-covers, the claws split into two usually unequal portions, the abdomen with 6 to 7 free rings. They are usually brightly coloured, especially at home in warm countries, include about 800 species, and almost always possess the blistering property above noticed. The life-history is often very remarkable. The larvæ live parasitically on bees, on grasshopper or locust eggs, &c., and seem to pass through an unusual number of changes, to which the name 'hyper-metamorphosis' has been applied. It is not merely that the larvæ begin life lean, horny, and 6-footed, and soon become fat, soft, and footless, but that before passing into the pupa stage, they pass through a series of preparatory changes. The important genera are: (1) *Lytta* or *Cantharis*, (2) *Mylabris*, (3) *Cercocoma*, (4) *Meloë*. In regard to some of these, a few notes are requisite. (1) The genus *Lytta* or *Cantharis* has wings, long, thread-like, 11-jointed feelers, and kidney-shaped eyes. It includes over 250 species, of which only 8 are European. The common blister-beetle or Spanish-fly, *Lytta* or *Cantharis vesicatoria*, is a splendid golden-coloured or bluish-green beetle (occasionally seen in England, as in Essex in 1901), common on many European trees, and devours their leaves. The females lay a large number of eggs in a hole in the ground, whence, after 3 to 4 weeks, the larvæ pass in all probability into certain bees. For medicinal purposes, the beetles are dried and rubbed into powder. The irritant substance is found throughout the body, but especially in the ovaries. (2) *Mylabris* is a rarer European genus, but includes even more tropical forms than *Lytta*, restricted, however, to the Old World. (3) *Cercocoma*, with 9-jointed feelers, is commoner in Europe; *C. schæfferi* is indeed frequent. (4) *Meloë* is a large wingless genus, with about 70 species, represented everywhere except in Australia. The females have a very broad abdomen. They live in grass. On irritation, they allow an oily, yellow, blistering fluid to ooze out from between the joints. The common Oil-beetle (*M. pro-scarabæus*) and another beautiful species (*M. variegatus*) are striking illustrations of romantic life-histories. For this and other particulars in regard to *Meloë*, see article under that head. Apart from their medicinal use, the physiology and life-history of these blister-beetles invest them with very considerable biological interest. The common blister-beetle, Spanish-fly or *Cantharis*, will be further treated at CANTHARIDES; and see below.

Blisters are medicinal agents which, when applied to the skin, raise the cuticle into vesicles filled with serous fluid. They are applied either in the form of plasters or in a fluid state, as suits the convenience of the person or part, and have for their object the establishing of a counter-irritation or diversion of inflammatory action from a part in which it cannot be reached by remedies, or from some organ where it may do permanent mischief, to some more superficial part of the body.

The most common blister in use is made of Cantharides or Spanish fly (*Cantharis vesicatoria*). Cantharides, mixed with a convenient proportion of lard and wax, form the blistering ointment in

ordinary use; the only objection to this preparation being, that if applied too freely, it produces much irritation of the kidneys and urinary bladder. A more convenient application is found in blistering fluid, which is simply painted on the part; or in the prepared plaster, which is cut to the desired shape and size and fixed to the part with a bandage. But under no circumstances should a blister be left long upon children, as it may produce sores which are difficult to heal.

Mustard (*Sinapis nigra*) is frequently used to redden the skin, but seldom left on sufficiently long to produce blistering. Tincture of cantharides, croton-oil, strong liquor ammoniæ, tartar emetic ointment, and many other drugs are used in practice.

If the occasion for the blister passes off, the vesicles should be pricked, and their fluid contents allowed to trickle away, the vesicated surface being then dressed with oil or vaseline. But if it should appear desirable to promote a discharge from the skin, the raised cuticle may be snipped off, and some stimulating application such as savine ointment (*Juniperus sabina*) used to dress the raw surface. Great cleanliness should be observed in dressing the part.

Blisters are used for the relief of acute inflammation in internal organs—e.g. the pleura, lungs, membranes of the brain; for the dispersion of the products left by inflammation—e.g. in indolent ulcers of the skin, enlarged lymphatic glands, pleural effusions, ovarian inflammation, and chronically inflamed joints; and for the relief of pain, even where no inflammation is present—e.g. in many forms of neuralgia. To name all the conditions where blisters may be of use would mean a very long list of diseases.

Blister is also one of the names applied to a bleb on the skin filled with fluid, by whatever cause produced—friction, disease, &c., as well as by vesicants, or other medicinal agents. See BULLÆ.

Blizzard is a fierce storm of bitter frosty wind with fine blinding snow, in which, especially in the western states of the American union, man and beast often perish. In one which visited Dakota and the states of Montana, Minnesota, Nebraska, Kansas, and Texas, in January 1888, the thermometer fell within twenty-four hours from 74° above zero to 28° below it in some places, and in Dakota went down to 40° below zero. In fine clear weather, with little or no warning the sky darkened and was filled by snow or ice-dust as fine as flour, driven before a wind so furious and roaring, that men's voices were inaudible at a distance of 6 feet. Objects became invisible a few yards off. Farmers died in the fields ere they could reach their houses, and children on their way from school; some of those who died having been not frozen but suffocated, from the impossibility of breathing the blizzard. Some 235 persons lost their lives. This was the worst since 1864; the Colorado River in Texas was frozen with ice a foot thick for the first time in the memory of man. In some districts blizzards are looked for three or four times in a winter; but really disastrous ones are rare, those of 1836, of December 1863, January 1866, January 1873 being, till that of 1888, the severest on record. The word, which seems to be akin to *blast*, *bluster*, first became usual throughout the United States during the severe winter of 1880–81, but was in colloquial use in the West early in the century. See WIND and STORMS.

Block, MARCUS ELIESER, a celebrated ichthyologist, born of poor Jewish parents at Anspach, in Bavaria, in 1723. He settled in medical practice at Berlin, where his life was uneventful, and where

he died, August 6, 1799. He is chiefly remembered for his great work, the *Allgemeine Naturgeschichte der Fische* (12 vols. Berlin, 1782–95, with 432 coloured plates), long the most comprehensive work on ichthyology, and still valuable, especially for its illustrations.

Block, in the rigging of a ship, is an important part of the apparatus necessary for raising sails and yards, tightening ropes, &c. The block comprises both the frame or shell, and the pulley or pulleys—usually termed 'sheaves'—contained within it. In nautical and mechanical language a *tackle* includes the rope as well as the block through which it works. Ships' blocks vary greatly in size, shape, power, designation, and use, but nearly every block comprises a shell or wooden exterior, a *sheave* or wheel on which the rope runs, a *pin* or axle on which the sheave turns, and a *strap* (of rope or iron) to fasten the block to any particular station.

For very many years, the uniform practice was to bind the shells by straps of rope—hempen or wire—but in more recent times, only the smaller class of blocks are thus bound, and those of a heavy calibre are envired by a band of iron—sometimes inside the shell, and said to be 'inside ironbound,' and sometimes outside, when they

are termed 'outside ironbound.' Ironbound blocks have been in use in merchant-ships for a much longer period than in government vessels, on board which modern improvements are often slow of being adopted. A single block contains only one sheave, a double block, two; a treble block, three; and so on;

while the term 'purchase-block' is generally applied to all blocks having more than two sheaves. All the blocks on board ship have distinctive names—e.g. *cat-block*, *cheek-block*, *clew-garnet-block*, *clew-line-block*, *boat-block*, *snatch-block*, &c., according to the kind of service they have to perform, or to their place of fixing, while not a few names are examples of the odd and sometimes unaccountable nomenclature adopted by seamen.

Ships' blocks are usually made of elm, and the sheaves of lignum-vitæ, the hardest kind of wood procurable in any considerable quantity. The pins are of iron or steel, and the bushes or bearing parts of the sheave are usually of brass. Patent roller bushes, which allow the sheave to turn with minimum of friction, have for several years been largely adopted. The figures show examples of the blocks most commonly in use.

Blocks made wholly of iron (see PULLEY) are used to some extent about the decks of ships, but are ill adapted for use in ships' rigging, on account of the chafing and fraying of ropes and sails thereby entailed.

Until near the end of the 18th century blocks were all made by hand, and the trade was of considerable importance. For one of the old seventy-fours of the navy alone, more than 1400 blocks were required, and for vessels of larger or smaller size a proportionate number. The introduction of steam in place of the 'unbought wind' as a propulsive power, has materially reduced the number of blocks required on board ship, and the adoption of specialised labour-saving machinery has rendered



a, single 'outside ironbound' block;
b, double 'inside ironbound' block
(with swivel hooks).

their manufacture at the present time a matter of great ease and simplicity. Two men, comparatively unskilled, with the aid of the machines now in use, can produce as many complete blocks in one day as would have taxed the efforts of the skilled artificers of other days during the best part of a week. In 1781 a Mr Taylor began to make the sheaves and shells of blocks by a process which he had invented. He made all the blocks for the royal navy until the expiration of his patent rights. The Admiralty then commenced the manufacture on their own account. In 1801 Mr (afterwards Sir) Marc Isambard Brunel submitted to the Admiralty plans of a system of machinery for block-making, which was accepted, and the inventor engaged to set up the apparatus at Portsmouth. In 1808 the system was put into effective operation, it being found even then so perfect, that very few additions or improvements have since been needed. The machinery made blocks more accurately than they had ever been made by hand, and with the aid of ordinary workmen only. It could effect £50,000 worth of work in a year, or 140,000 blocks, by the assistance of ten men in attendance. Duplicate machinery was made for Chatham. Brunel received £20,000 for his invention and for his personal superintendence until the machinery was brought into working order; this sum was money well laid out, for the system saved to the country more than £20,000 a year, in the busy warlike period from 1808 to 1815.

Block, MAURICE (1816-1900), born at Berlin of Jewish family, studied at Bonn and Giessen, but settled at Paris, where he held a post in the statistical bureau (1852-62). He published many works on the statistics of France and Europe, including the *Annuaire de l'Économie Politique et de Statistique*.

Blockade, in a military sense, is an operation for capturing an enemy's town or fortress, often without a bombardment or regular siege. The attacking party throws up works on the neighbouring heights and roads, so as to guard every exit from the town, and the place is now said to be 'invested.' The rest of the besieging force remains under cover in villages, or in a temporary camp, ready to repel any sortie attempted by the besieged. The whole purpose in view is to prevent the besieged from receiving supplies of any kind, in order that, when the food or the ammunition is exhausted, they may be compelled to surrender. Fortresses situated on steep and rocky eminences, difficult to conquer by bombardment or assault, may often be reduced by blockade; because the roads or paths for the reception of supplies are few, and can be watched by a small number of troops. Towns situated on a plain are less easily invested; but if the inhabitants are numerous and commercial, they will soon be impatient of the restraint produced by a blockade, and compel the governor to surrender. When, therefore, resistance is determined on, the governor sends out of the town as many non-combatants as possible. He then collects all the stores in bomb-proofs, places the inhabitants on an allowance of food and under military rule, and endeavours, by frequent sorties, to prevent the besiegers from completing the investment of the place. A blockade should be the first step in a regular siege, and its effects may often be made more quickly felt by a bombardment. The blockade of Paris by the Germans in 1870-71 is the most notable example of such an operation that has ever been known. It was of itself completely successful in four months. In this case a large civil population was blockaded together with a numerous army; but at Metz, in the same campaign, a large and well-appointed army, compara-

tively unhampered by the civil population, was compelled to surrender by a blockade without bombardment in less than three months (see also **SIEGE**). In 1877 Plevna was reduced by blockade, after Russia and Rumania had assaulted unsuccessfully three times. In the Great War there was no blockade proper on land.

Blockading, in a naval sense, is the prevention of the entrance or exit of the enemy's ships at a particular port, or at all the ports on a stretch of coast, so as to bring pressure to bear upon the inhabitants by obstructing their trade; and it renders intercourse with the enemy's ports unlawful on the part of neutrals. It is also sometimes an auxiliary to the military blockade by land. For a valid blockade it is necessary that a state of war should exist; that the blockade be really effective, that is to say, it must be maintained by a force sufficient to prevent access to the enemy's port, or at least to render approach hazardous; and neutral nations must be informed by the blockading power, either by official notification to all those powers, or by warning given to neutral vessels which approach the line of blockade. But when a blockade has become notorious, the knowledge will be presumed against any merchant-vessel which attempts to enter the blockaded port. Effective blockade is the principle laid down in the Declaration of Paris (1856), but this is construed more rigidly by continental nations than by England or the United States. Riga was effectively blockaded during the Crimean war at a distance of 120 miles. The French insist more than we do on formal notice. The blockading force may seize any vessel with its cargo trying to trade with the port, and send it home for condemnation; and if the vessel succeed in breaking the blockade, it may be pursued and captured by a belligerent, until it has reached its port of destination. That breach of blockade involves confiscation of the ship is admitted by all civilised nations. The cargo is not forfeited unless its owner is the owner of the ship, or was cognisant of the intended violation.

Napoleon's Berlin decree of 1806 declared the British Islands in a state of blockade (see **CONTINENTAL SYSTEM**).

A memorable blockade was that of the ports of the Southern States by the Federal government during the American civil war. The blockade was begun in April 1861, and, extending as it did to the whole of the southern coast and ports, was at first somewhat ineffective. Ultimately it was more rigorous and systematic; but to the last a considerable trade was carried on by swift steamers. During the Great War, 1914-18, Germany was blockaded, and the effectiveness of the blockade contributed largely to the winning of the war by the Allies. The approaches to Germany were blockaded by the Dover Patrol and 10th Cruiser Squadron of 24 armed mercantile cruisers, with 18 trawlers operating between Iceland and the Shetlands and Hebrides. In two years this squadron intercepted and examined 15,000 vessels, and only 4 per cent. of the vessels attempting to get through were not examined, in spite of blizzards, fog, dark nights, &c. The Grand Fleet, stationed partly at Rosyth and partly at Scapa, prevented the blockading vessels from being molested excepting by submarines.

See **CHARLESTON, NEUTRALITY, PRIZE COURT**; and as to the law, books by Twiss, Hall, Phillimore, Hazlitt, Roche, T. Laurence, Halleck for England; Wheaton for the United States; Hautefeuille, Heffter, Gessner, and Bluntschli for the continent of Europe; the collections of treaties; and the proceedings of the *Alabama* Commission. Lord Stowell's decisions in the prize court during

the French wars may be said to form the substance of English law on this subject:

Blockhouse is a bullet-proof building of any material, roofed in and loopholed, often made with the floor sunk 4 or 5 feet. If timber alone is used, it must be 3 feet thick to resist modern rifle-bullets. Better material is sheeting of wood or corrugated iron, with 6 inches of stones or 12 of earth between. The buildings are not proof against artillery attack, and it is difficult, but not impossible, to render them inconspicuous. They are particularly useful in savage warfare, in mountain and forest country, as well as for the use of posts guarding bridges on a line of communications from raids, and as keeps on the rear faces of redoubts for a final stand. In this case they must be very solidly roofed, and kept low and inconspicuous. In the Great War they were often made of very solid reinforced concrete, proof against all but the heaviest shells; the concussion, however, of a direct hit would sometimes kill the whole garrison, without a break-through. A blockhouse may be of any size and shape, and forms a barrack for its garrison. If large it is generally cruciform in plan, so as to gain flank defence, or the upper story may project over the lower to enable men to fire through loopholes in the floor. The same object is sometimes attained by placing the upper story diagonally across the lower one. A ditch is excavated round the blockhouse to prevent the enemy getting close enough to set it on fire or to use the loopholes. Stakes are planted in the ditch to make it difficult for the enemy to collect in it, and there rally for the final assault. In the later guerilla stages of the Transvaal (q.v.) war (1901-2) extensive use was made of a series of blockhouses by Lord Kitchener. Nearly 5000 of them were built, from 2000 to 3000 yards apart, totally enclosing a very large extent of country. They were constructed of sheets of corrugated iron 4 inches apart, filled in with stone ballast, and surrounded and connected by barbed wire.

Block Island, 9 miles S. of Rhode Island, U.S., is 8 miles long, and contains the township of New Shoreham, a summer-resort.

Block-printing, the method of printing, or producing *Block-books*, from wooden blocks. See BIBLIA PAUPERUM, WOOD-ENGRAVING, PRINTING.

Block-system. See RAILWAYS.

Bloemfontein, the capital of the Orange Free State, in the South African Union, as in the days of the republic, stands on the Modder, in a high (4450 feet) and healthy district, 200 miles W. by N. of Durban. It is connected by railway with the Cape and, since 1890, with Johannesburg and Natal. It is the seat of the South African Supreme Court, of an Anglican bishopric, and of sundry colleges, and has a good deal of trade, mainly in wool. During the war Bloemfontein was occupied by Roberts (May 1900), and here it was proclaimed that the Orange Free State had become a British colony. Pop. 36,000, nearly one-half white.

Blois, the capital of the French department Loir-et-Cher, has a remarkably fine situation on a steep acclivity, and is built chiefly on the right bank of the Loire. The old town, with its crooked, narrow streets, is mainly on the hill, crowned by the historic castle; the new business town, with fine quays, is near the river. An eleven-arch bridge (1717), 1000 feet long, unites the town with its suburb of Vienne on the left bank. It is 36 miles SW. of Orleans. Blois has a cathedral; but its chief glory is its old castle, which has been the scene of many interesting historical events. Louis XII. was born in it; and under its roof Charles, Duc d'Alençon, and Margaret of Anjou were married. Here also the Duc de Guise and his brother, the

cardinal, were murdered, by order of Henri III., 23d December 1588. Isabella, queen of Charles VI., here found a retreat; it served as a prison for Mary de' Medici; Catherine de' Medici died within its walls; and Maria Louisa here held her court in 1814, after Paris had capitulated. The castle was then neglected and used as a barrack; since 1845, but especially in 1880-87, a great part of it has been finely restored at great cost. Blois is a place of great antiquity. Stephen, who usurped the crown of England on the death of Henry I., was a son of one of the counts of Blois, by Adela, the daughter of William the Conqueror. Other celebrated natives have been Peter of Blois, subsequently archdeacon of London, and author, who died in 1200; and Denis Papin (q.v.), to whom a statue has been erected. Blois is an archbishop's see, and has manufactures of porcelain and gloves, with a trade in brandy, wine, and wood. Pop. 24,000.

Blomefield, FRANCIS, the topographer of Norfolk, rector of Hargham and Fersfield, and afterwards of Brockdish, was born at Fersfield, 23d July 1705, and died 16th January 1752. The great achievement of his life was his *History of Norfolk*, which, though abounding in errors, is a vast storehouse of information on the subject. In 1735, while collecting materials for it, he discovered the 'Paston Letters.' The first volume appeared in folio in 1739, the second in folio and quarto in 1745; Blomefield died ere the completion of the third volume, which, with a fourth and fifth by the Rev. C. Parkin, appeared at Lynn (1769-75; new ed. 11 vols. London, 1805-10; index, 1862).

Blomfield, CHARLES JAMES, Bishop of London, was born in 1786 at Bury St Edmunds, in Suffolk, where his father was schoolmaster. Thence he passed to Trinity College, Cambridge, of which he was elected a fellow; and taking orders in 1810, he became incumbent of St Botolph, London (1819), Archdeacon of Colchester (1822), and Bishop of Chester (1824), whence in 1828 he was translated to London. Blomfield's reputation for classical scholarship rests on his editions of Æschylus, Callimachus, Euripides, &c. He was exceedingly active in the superintendence of his diocese, and was an originator of the movement for the erection of new churches, setting about the building of fifty at once. He died 5th August 1857. See the Life by his son (2 vols. 1863).

Blommaert, PHILIP, a Flemish author, with Conscience a reviver of the Flemish tongue, born at Ghent in 1809. In 1834 he published a volume of verse; but he rendered better service to literature and to the patriotic cause by his editions of *Theophilus* (1836), an old Flemish poem of the 14th century, and of the *Oudvlaemsche Gedichten* (3 vols. 1838-51) of the 12th, 13th, and 14th centuries. His most important work is a history of the Belgians (1849), in which he shows that the Low Countries, spite of political separation, have a unity of culture, and that the political welfare of Belgium is opposed to a French alliance. He died at Ghent, August 14, 1871.

Blondel, a celebrated French minstrel of the 12th century, born at Nesle, in Picardy, was a favourite of King Richard the Lion-heart, and accompanied him to Palestine. When, in 1193, Richard on his homeward journey was seized and imprisoned by Leopold, Duke of Austria, the minstrel wandered through Germany in disguise seeking his master, and at length came to the castle of Dürrenstein, in Austria, in which he heard that there was some illustrious captive. He placed himself under the tower and commenced singing a love-song which Richard and he had composed together. Hardly had he finished the first stanza,

when a well-known voice from the tower took up the second, and carried it on to the end. So the minstrel discovered his monarch, and, returning with all speed to England, was the means of his being ransomed by his subjects. Unfortunately, this story rests solely on the French Chronicle of Rheims, belonging to the latter half of the 13th century; its popularity dates only from Grétry's opera (1784). The poems that have come down to us under Blondel's name are poor and uninteresting; they were published by Tarbé in the *Collection des Poètes Champenois* (vol. xix. Rheims, 1862).

Blondin, CHARLES, rope-dancer, born 24th February 1824, at St Omer near Calais, his real name being Jean François Gravelet. In 1859-60 he four times crossed the Niagara Falls on a tight-rope, once blindfolded, once trundling a wheelbarrow, once carrying a man on his back. He also performed in London, and he died in Ealing in 1897.

Blondlot Rays, thought by Professor Blondlot of Nancy (1903) to be given off by almost all substances (human nerve and muscle as well as steel bars) when in a state of strain, and by him called N-rays, were never verified by English or German experimenters, and by 1907 were given up by everybody. Becquerel had verified Blondlot's observations, the discoverer received a gold medal from the Academy, and in 1903-6 no less than 176 papers were published on the (non-existent) rays.

Blood is the red-coloured fluid found in the heart and blood-vessels. Its amount is from $\frac{1}{10}$ to $\frac{1}{5}$ of the body by weight. It is an opaque, sticky fluid with a specific gravity of about 1055, an alkaline reaction, an aromatic odour, and a saline taste. Its colour varies with its condition as regards oxidation. Blood which has come from an artery or been exposed to the air is bright red, while venous blood is much darker and almost purple in colour. When a drop of blood is looked at under the microscope it is seen to consist of a number of formed elements floating in a clear straw-coloured fluid, the *plasma* or *liquor sanguinis*.

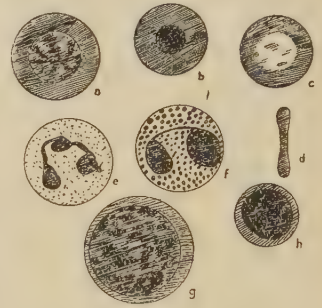
The formed elements are the red blood corpuscles or erythrocytes, the white cells or leucocytes, the blood plates, and granular material known as *hæmocoenia* or blood dust.

The *red corpuscles* in the mammals, with the exception of the camelidæ which have elliptical corpuscles, are bi-concave discs. They have an interesting life-history. In the young embryo all the red corpuscles are much larger than those found in post-natal life. They have a large nucleus showing an open chromatin network, and are known as megaloblasts. In later fetal life these cells are replaced by others not so large with a nucleus which is much denser. These are known as normoblasts. In mammalia, except in early embryonic life, the nucleus undergoes a process of digestion and absorption before the corpuscle is passed into the circulating blood, and it is only in conditions of disease that nucleated red cells are found in the blood-vessels. They remain numerous, however, in the red bone-marrow found in the flat bones and at the ends of the long bones, as it is in these situations that the red corpuscles of the blood are developed. In the lower vertebrates—birds, reptiles, amphibians, and fishes—the red cells are oval and the nucleus persists throughout the life of the corpuscle. The size of the blood corpuscle varies considerably in different animals. In man its diameter is .0075 millimetre or $\frac{1}{3200}$ inch. The corpuscles when seen singly are pale yellow. It is only when they are massed together that they appear red. When blood is shed the red corpuscles tend to run together and adhere in long columns like piles of coins or *rouleaux*. The erythrocytes are very easily affected by changes in the salt con-

tent of their surroundings. If the fluid surrounding them becomes concentrated by evaporation or by the addition of salt the corpuscles become jagged and irregular in outline, and are then said to be *crenated*. If, on the other hand, the plasma be diluted with water the corpuscles swell up, and if the dilution passes a certain point they rupture and the greater part of their contents passes into solution. The blood then becomes transparent, and is said to be *laked*. The corpuscles are soft and elastic, and are surrounded by a fine elastic membrane. Inside this membrane is a

loose delicate stroma which supports a red pigment known as hæmoglobin. The base most abundantly present is potassium. Lecithin and cholesterol appear to enter largely into the composition of the membrane and stroma. The hæmoglobin constitutes 90 per cent. of the solid matter of the corpuscles. It is closely allied to the proteins, but contains .42 per cent. of iron. It is readily oxidised, and in combination with gases gives characteristic absorption bands when examined with the spectroscope. The red corpuscles number 5,000,000 per c.mm. in the adult male, and 4,500,000 per c.mm. in the female. Their numbers may be greatly diminished in disease, and in the severer anæmias nucleated red corpuscles may escape from the bone-marrow into the circulating blood.

The *leucocytes* or white cells are spherical in shape. Several varieties have to be distinguished. The most numerous is the *neutrophil* leucocyte, which has a lobulated nucleus and shows granules with a special affinity for a mixture of acid and basic dyes in its protoplasm. This cell is considerably larger than the red corpuscle. It constitutes about 70 per cent. of the white cells. Its numbers are increased in the circulation in most of the ordinary infectious diseases. The *eosinophil* leucocyte has larger granules which have a special affinity for the aniline dye known as eosine. It should not exceed 4 per cent. of the leucocytes in health, but in many infections with animal parasites and some other conditions its numbers are much greater. The *lymphocyte* has a rounded nucleus. It varies in size from that of the red corpuscles to three times their size. It tends to increase in chronic infections such as tuberculosis. In health its percentage of the white cells is about 25. All varieties have the power of throwing out processes and changing their shape and position. This is known as amoeboid movement, since it is similar to that seen in the simple organism, *Amœba* (q.v.). They have also the power of ingesting micro-organisms or other foreign particles with which they may come in contact (see PHAGOCYTES). The leucocytes number about 7000 per c.mm. Their numbers are increased in the blood during digestion, in pregnancy, and in a great variety of pathological conditions as indicated above. The granular leucocytes are developed from cells in the red bone-marrow, known as myelocytes. The lymphocytes are also derived from bone-marrow as well as from various lymphoid tissues throughout the body.



a, Large nucleated red cell of the early embryo; b, nucleated red cell of bone-marrow; c, ordinary red blood corpuscle; d, the same in profile; e, neutrophil, f, eosinophil, leucocyte; g, large, h, small, lymphocyte. From human blood magnified 1000 times.

The *blood plates* are colourless refractile discoid bodies less than half the size of a red corpuscle. They seem to play an important part in connection with the process of clotting of the blood. Otherwise their origin and significance are unknown.

Hæmocoria consist of small colourless granules. The term 'blood dust' probably suggests their significance.

The *blood plasma* is usually clear and transparent, but after a fatty diet it may appear milky. It contains serum albumen and serum globulin. A globulin of special importance is known as fibrinogen. It also contains sugar, fats, and waste products, such as urea derived from the tissues. The most abundant of the inorganic constituents are salts of soda, but there are also small amounts of calcium, potassium, and magnesium. The yellow colour is due to the presence of a fatty pigment or lipochrome.

Coagulation of the Blood.—After blood has been withdrawn from the vessels it forms a jelly-like mass. This change occurs in about ten minutes. If this clot is now left undisturbed a clear yellow fluid begins to exude from it and the clot diminishes in size, so that after a few hours it will be found to have retracted from the walls of the containing-vessel and to be surrounded by the fluid which has exuded. This fluid is known as *serum*. Serum on analysis is found to be the same as plasma, except that it contains no fibrinogen. If a portion of the clot be washed in running water, it is found to consist of stringy elastic whitish threads which have entangled the blood corpuscles. The stringy material is called fibrin. Coagulation therefore consists of the transformation of the soluble globulin, fibrinogen, into the insoluble fibrin. If blood as it is shed be beaten up with a stick the fibrin adheres to the stick, and the corpuscles, instead of becoming entangled in the fibrin, remain in the serum. The resulting serum and corpuscles is called defibrinated blood. Clotting is hastened by heating the blood. It is delayed by cooling the blood and by the addition of strong solutions of salts. When clotting is prevented and blood allowed to stand, a sediment of corpuscles falls to the bottom, leaving above a clear layer of plasma. The heavier red corpuscles fall to the foot; the lighter white cells form a layer above. The chemistry of coagulation is very elaborate. It appears to be due to the action of a ferment, the fibrin ferment or thrombin. This ferment seems to be evolved by the union of an antecedent substance, prothrombin, which is present in the leucocytes, with salts of lime. But the union does not appear to take place spontaneously, but only after the addition of a tissue extract, such as may come from the edges of a wound.

Functions of the Blood.—The blood plays an essential part in connection with the nutrition of the body. The plasma carries the nutrient material absorbed from the food to the tissues, and conveys the waste products of tissue activity to the excretory organs. The carbon dioxide formed by the tissues combines with the soda, and when the lungs are reached it leaves the soda and passes into the atmosphere. The red corpuscles are the carriers of oxygen from the lungs to the tissues. The leucocytes act as distributors of food, and play an important part in the defence of the body against infectious disease. Coagulation of the blood is a provision to protect the body from hæmorrhage. The blood is also the carrier of chemical messengers or hormones which are produced by one organ and effect the activity of another organ at a distance. See RESPIRATION, ARTERIES, CIRCULATION, VEINS; also ANTISEPTIC SURGERY, BACTERIA, BLEEDING, BLOOD-STAINS, GERM (for the germ theory of disease), INOCULATION, MALARIA, PHAGOCYTES,

PYÆMIA, TRANSFUSION, WOUNDS; further, ANIMAL HEAT, TEMPERATURE.

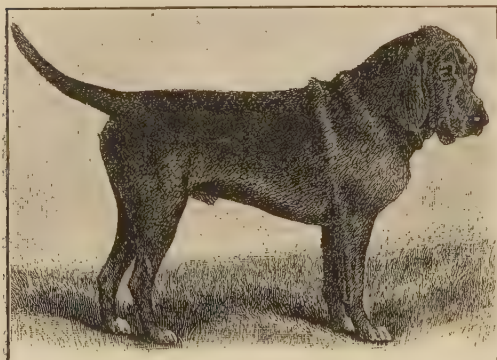
Of old it was reckoned the duty of the next of kin to avenge a murdered relative; but among some primitive peoples, as the modern Bedawins, the right is annulled by compensation. The Mosaic law prohibited the commutation of the penalty of death for money, and appointed *cities of refuge* for the involuntary manslayer. See CITY OF REFUGE, SANCTUARY, BLOOD-WITE, WERGILD. For the blood-feud, see VENDETTA. The eating of blood was prohibited by the Old Testament. Christians have generally regarded the prohibition as having ceased with the reason for it, and consider the exhortation of the apostolic council of Jerusalem to the Gentile converts, to abstain 'from things strangled and from blood,' to have been merely an application of the great law of Christian charity to the circumstances of a transition period, with reference to the prejudices of Jewish converts. Jews still always kill their own butcher-meat, and Mahomedans observe similar rules. Among some primitive peoples the bond of blood-brotherhood is established between friends by ceremonious mixing and drinking of their blood. See also SACRIFICE, LORD'S SUPPER, TRANSUBSTANTIATION.

Blood, THOMAS, adventurer, was born in Ireland about 1618, and in the Great Rebellion sided with the parliament. Deprived of his estate at the Restoration, he put himself in 1663 at the head of a plot to seize Dublin Castle and Ormonde, the lord-lieutenant. On its discovery his chief accomplices were seized and executed; but he himself escaped to Holland, and was there received with high consideration. He soon found his way back to England to try what mischief might be brewed among the Fifth-Monarchy men; and thence proceeding to Scotland was present at the battle of Rullion Green (1666). On the night of 6th December 1670, the Duke of Ormonde was seized in his coach in St James's Street by a gang of braves, tied on horseback behind one of them, and hurried away towards Tyburn. The timely approach of his attendants at the moment when, in struggling with his riding-companion, he had succeeded in bringing him to the ground, probably saved the duke from hanging. Blood was the leader in this daring villainy. His next enterprise was still wilder and more dangerous. On 9th May 1671, disguised as a clergyman, with three accomplices he entered the Tower, determined to carry off the regalia. After nearly murdering the keeper of the jewels, he actually succeeded in getting off with the crown under his cloak, while one of his associates bore away the orb. They were pursued, however, seized, and committed to the Tower. Now came a singular turn of fortune. At the instigation of Buckingham, who was accused of having hired Blood to attack the Duke of Ormonde, King Charles visited the dauntless miscreant in prison, and, dreading the threat that there were hundreds of Blood's associates banded together by oath to avenge the death of any of the fraternity, pardoned him, took him to court, restored him his estate of £500 a year, and raised him so high in favour that for several years Colonel Blood was an influential medium of royal patronage. He quarrelled, however, with Buckingham, and was committed by the King's Bench on a charge of slander against him; he was bailed out, but died on 24th August 1680. See T. Seccombe's *Lives of Twelve Bad Men* (1896).

Blood-bird of New South Wales (*Myzomela sanguinolenta*), a species of Honey-eater (q.v.) (Meliphagidæ), so named from the rich scarlet colour of the head, neck, breast, and back of the male. A very similar species is found in Bengal.

Blood-flower (*Hæmanthus*), a genus of Amaryllidaceæ (q.v.), mostly natives of South Africa, some of which are common in greenhouses. They take their name from the usual colour of their flowers, which form a fine head or crowded umbel. The bulbs are sometimes propagated by cutting them across above the middle, so as to stop the single growing point; new axillary bulbs then form around the outer edge. The species seem generally to possess poisonous properties. The inspissated juice of *H. toxicarius* is used in South Africa for poisoning arrows.

Bloodhound, a variety of Hound (q.v.), remarkable for its exquisite powers of scent, and for the eagerness with which it tracks a bleeding animal; it is able to select a freshly-wounded deer from among a herd, and follow its trail; and from this faculty it derives its name. It was also formerly called, both in England and Scotland, *sleut-hound* or *sleuth-hound*, from the Middle-English *sleuth*, 'a slot or track' (Icel. *sloth*). The bloodhound was formerly common and much in use in Britain, as well as on the continent of Europe for hunting purposes, being in the possession of most noble families, who vied with one another in the purity and excellence of their different strains,



Bloodhound.

but is now rare, though Lord Wolverton, who died in 1887, at one time hunted a pack of bloodhounds in Dorsetshire. Bloodhounds were also much used to track escaped prisoners, and are mentioned in the poetical histories of Bruce and Wallace as being used by their enemies to discover them; and in later days they were resorted to by slave-owners in America in the pursuit of fugitive slaves. The bloodhound is a large tan-coloured dog, with an exceedingly handsome and noble head expressing dignity and strength. The head should be long and narrow, with a dome-shaped skull, the occipital bone forming a peculiar peak on the back of the skull; the eyes distinctly showing the third eyelid or 'haw,' which gives the eye a bloodshot and rather fierce look; the ears long enough to meet in front of the nose, but falling down close on either side of the face; colour, a rich tan with a dark saddle, showing no white if possible. The bloodhound is rather unmanageable when thoroughly roused, on account of his courage and strength, but when properly treated is generally docile, and makes a capital watch-dog. Many interesting anecdotes are recorded of the perseverance and success of bloodhounds in following a track upon which they have been set, even when it has led them through much frequented roads. As recently as 1898-1908 attempts have been made in England to track murderers by means of a bloodhound.—The CUBAN BLOODHOUND, notorious as having been employed

in the pursuit of felons and of fugitive slaves in Cuba and the slave-holding states of the American Union, differs largely from the true bloodhound, and is really the descendant of mastiffs with a bulldog cross, inferior to the real bloodhound in scent and all but ferocity; it is also called the Cuban mastiff. According to Powell (*The American Siberia*, 1892), foxhounds, specially bred and trained, are used for man-hunting in nearly all the convict-camps of Florida, &c. For the true bloodhound's kin, see TALBOT.

Blood-poisoning is a name loosely used of Pyæmia (q.v.) and allied diseases (see POISON, WOUNDS). It is also used popularly in a wider sense for the results on the human system of poison germs from malaria, bad drains, &c.; or for the condition of the blood caused by such ailments as Bright's disease of the kidneys. See GERM, HYGIENE, MALARIA, PTOMAINES, TYPHOID FEVER, &c.

Blood-rain, which doubtless has its origin in the up-rushing currents of waterspouts and whirlwinds, has frequently fallen in Italy and southern Europe, and has been repeatedly traced, through the microscope and chemical test, to the sandy deserts of northern Africa adjoining. Similar rains have fallen in the Canaries, and they may be likewise ascribed to the African desert to the eastward. In these cases the origin is the rainless whirlwinds of these arid deserts, which are locally called 'devils.'

Blood-root. See GEUM, HÆMORRHOÏDACEÆ, and SANGUINARIA.

Blood-stains are often an important means of establishing the guilt of prisoners, especially in murder trials. The methods for distinguishing the kind of blood that gave rise to the stain fall into three groups, of which the newest is the *Serological* or *precipitin* test, which distinguishes human from other mammalian blood. The oldest method was the *Visual*—aided by *a*, ordinary lens; *b*, microscope; *c*, spectroscope; *d*, artificial light. A third method is *Chemical*—*a*, heat—*positive* (1, change of colour; 2, coagulation); *b*, ammonia—*negative*; *c*, hæmatin test; *d*, guaiacum test.

Blood when liquid stains all articles with which it comes in contact. It sinks into woven textures and such material as soft wood, but on metallic surfaces and on hard woods it forms a film of greater or less thickness, and quickly dries. At first it is of a reddish-brown colour, but in the course of a few weeks this deepens and becomes almost black.

Looked at with a lens of low power—say 10 or 20 diameters—the blood, if in any quantity, and coagulated, and if it has not sunk into the texture of the cloth, is observed to present an irregular surface, and entangled in it have frequently been detected foreign materials which have afforded a clue to the culprit, and to the manner in which the crime has been committed. Thus hairs, fragments of cotton, epithelial scales from the throat, and minute fragments of birds' feathers have often been noted. This preliminary investigation concluded, the attempt is now made to discover the peculiar corpuscles of the blood (see BLOOD). This is a matter of great difficulty when the blood has stained such articles as linen or cotton stuffs and become dry, but when spilt on hard surfaces, or when it is in such quantity as to form a distinct coagulum, the corpuscles are generally easily determined by the following process. The object is, by breaking up the coagulum, to dissolve out the corpuscles in some medium as nearly as possible of the same density as the *liquor sanguinis* of the circulation. Numerous media have from time to time been proposed, such as solutions of sugar, phosphate of soda, iodide of potassium, &c., but the one generally employed is a solution of glycerine in

water of specific gravity 1.028. If this solution be applied, for example, to the stained blade of a knife, or if a minute portion of dried blood-clot be gently dissolved in it, a reddish fluid is obtained which under a high power of the microscope (300 diameters) rarely fails to exhibit numerous corpuscles which by their peculiar appearance (see BLOOD) are at once recognised to be mammalian blood-discs. In the case of stained linen, &c., there is greater difficulty. The stained portion must be thoroughly moistened with the solution, and then squeezed over a glass rod. When the reddish fluid reaches the surface, it must be removed with the blade of a knife, placed on glass, and submitted to the microscope. By this simple process, unless the stain be of great age, its character is determined. Human blood in these circumstances, however, cannot be distinguished from the blood of the other members of the great class of the mammalia, with the solitary exception of the camel tribe, which present an oval blood-corpuscle (see CAMEL).

Of late years, the interesting fact has been discovered that blood possesses a distinct spectrum, so that it is possible to determine that a reddish fluid is really blood, although the corpuscles may not have been discovered owing to their accidental destruction. The stained portion of cloth or a portion of blood-clot is digested in distilled water, and as the result a liquid of a reddish colour is obtained. This should be placed in a deep narrow cell and examined by a spectroscopic eye-piece with a low power of the microscope. Two dark bands make their appearance, one in the middle of the green rays, and the other at their junction with the yellow. These are highly characteristic of the presence of the blood of some red-blooded animal. See SPECTRUM, and SPECTROSCOPE.

Lastly, under this head of the visual detection of blood, the presence of blood-stains may unexpectedly be discovered with artificial light, by examining the furniture and especially the walls of an apartment on which blood has fallen. During the day the spots of blood remain undetected, but at night, and with artificial light, they are clearly visible. It is especially on papers with dark-blue figuring that this interesting fact has been observed.

The chemical relations of blood are very definite. All stains due to blood are soluble, and this fact enables us at once to distinguish them from insoluble stains which closely resemble them, and which have frequently been mistaken for them, such as paint and ironmould. The stain to be examined is cut out and suspended by means of thread in a glass tube filled with distilled water. Should the stain be at all recent, it immediately dissolves, and long filmy streaks of colouring matter are discharged and descend in wavy lines to the bottom of the tube, where ultimately a stratum of reddish fluid of greater or less intensity is collected. The clear supernatant fluid is poured off, and the coloured portion is divided into two parts. One part is boiled, and if the fluid contain blood, the following peculiar changes take place. The colour is discharged, the redness disappears and gives way to a grayish green, and in addition a distinct coagulum is formed. Both these changes are highly characteristic of blood. Should some liquor potassæ be now added, the coagulum is redissolved, and shows a green colour by reflected light. This may be described as a positive test of the presence of blood. The action of ammonia supplies us with a valuable negative one. If this volatile alkali be added to a solution of blood, no change of colour is produced. All other soluble stains are more or less altered in colour, such as those from the juices of fruits, &c., which have frequently been mistaken

for blood, and thus have given rise to grave suspicions. If a particle of dried blood can be removed from a weapon or any surface, an attempt may be made to prove that it is blood by the formation of blood or hæmatin crystals. And where it was suspected that articles of clothing had been washed in order to obliterate the traces of blood, its presence has been determined by its reaction with the resin of guaiacum. On the suspected site of the blood-stain are placed a few drops of a spirituous solution of guaiacum freshly prepared. The resin is at once observed to separate on the surface of the cloth; if to this is now added a small quantity of peroxide of hydrogen, a beautiful sapphire-blue colour is struck.

The corpuscles of human blood cannot thus be distinguished from those of other mammals (save the camel, which has oval corpuscles). But if human blood is injected several times into any animal (rabbit, dog, sheep, horse), and if afterwards the animal is bled, a clear serum may be prepared, free of corpuscles. If to this serum a drop of human serum is added, it forms a precipitate which falls to the bottom. Even dried human blood can be recognised by this method; if it be dissolved in normal salt solution and placed in a tube containing the serum above described, and if then a precipitate forms, the stain being tested is the stain of human blood (there may be some risk of confounding the blood of apes with human blood). The serological or precipitin test has been made indispensable in Prussia in certain medico-legal inquiries.

See A. S. Taylor, *Principles and Practice of Medical Jurisprudence* (5th ed. 1905); and the manuals of Glaister, Poore, Giffen, McCallin, Husband.

Bloodstone, a dark-green stone spotted with red; see HELIOTROPE. Also a name for red hematite.

Blood-vessels. See AORTA, ARTERIES, BRACHIAL ARTERY, CAPILLARIES, CIRCULATION, VEINS; also such articles as ARTERIOTOMY, THROMBOSIS, VARICOSE VEINS.

Blood-wite (O.E. *blōd-wite*, 'blood-punishment'), in Old English law, a fine paid to the king or ealdorman for the shedding of blood as an offence against the state, as distinguished from the Were-gild (q.v.), or compensation to the slain man's kin.

Blood-worm, a name given by anglers and others to the very abundant aquatic larva of a gnat-like Dipterous insect known as *Chironomus plumosus*. This is the commonest of a large number (195) of British species, and the larva is very frequent in stagnant water. It has a worm-like appearance, a blood-red colour, and is used for bait. The development of *Chironomus* is of great biological interest on account of the very early isolation of those elements which are to form the future reproductive organs of the insect. Before the cells of the dividing egg have had time to change at all, these future reproductive rudiments are set apart, and as they do not share in the future changes of development, they must obviously preserve intact the constitution of the parent, and hand it on to the next offspring. See HEREDITY.

Bloomer Costume, a ladies' dress partly resembling male attire, which arose out of what is termed the 'Woman's Rights Movement' that began to be agitated in the United States about the year 1848. About the same time, and in close connection with this movement, arose an agitation for the reform of female attire. In 1849 Mrs Bloomer (who died 31st December 1894) adopted the costume to which she has given her name, and lectured on its advantages. The Bloomer dress consisted of a jacket with close sleeves, a skirt falling a little below the knee, and a pair of Turkish trousers. Though a few ladies followed

the example of Mrs Bloomer, the dress was extremely unpopular, and exposed its adherents to a degree of social martyrdom which the more prudent, timid, or amiable declined to brave. Dress reformation societies and private persons have from time to time advocated changes in the costume of women less radical than Mrs Bloomer's, especially a knickerbocker dress for bicycling.

Bloomery, the first forge through which iron passes after it has been melted from the ore, and where it is made into *blooms*. See IRON.

Bloomfield, ROBERT, the author of *The Farmer's Boy* and other pastoral pieces, born 3d December 1766, at Honington, near Bury St Edmunds, was the son of a poor tailor, who died when Robert was a year old, leaving his wife to struggle with a school, where the future poet learned to read. At the age of eleven he was hired to a farmer, but ultimately became a shoemaker in London, where he wrote his *Farmer's Boy* in a poor garret. Through the efforts of Capel Lofft it was published in 1800, had extraordinary popularity, and was translated into a number of languages. He subsequently published *Rural Tales*, *Wild Flowers*, and other pieces. The Duke of Grafton interested himself in his behalf and gave him a small allowance. He made *Æolian* harps, wrote poetry, and embarked in the book-trade, but failed. Latterly his health broke down, he became hypochondriac and half blind, and he died in poverty at Sheffield, in Beds, 19th August 1823. A complete edition of his works appeared in 1824, and there were editions in 1864 and 1883. See Darlington's introduction to *The Farmer's Boy* (1898).

Bloomington, capital of M'Lean county, Illinois, 126 miles SSW. of Chicago, is an important railway centre, and has a brisk trade and large railway-works, with foundries, furnaces, and coal-mines. There is a Wesleyan university in the town; and near it (at Normal) is the Illinois Normal University, in connection with which there is a state laboratory of natural history. Bloomington has a court-house built of Illinois marble, a Roman Catholic academy, and the Major College for women. Pop. (1860) 7075; (1920) 28,725.—There is another Bloomington, a city lying between the branches of the White River, 60 miles SSW. of Indianapolis, in Indiana, seat of the Indiana University. Pop. 11,600.

Blouet, PAUL, better known as 'Max O'Rell,' satirist and lecturer, was born in Brittany 8th March 1848, and educated in Paris. As a cavalry officer he was wounded in the Franco-German war (1870), and coming to England as a newspaper correspondent in 1872, he taught French at St Paul's School, 1876-84, and was editor of the Paris *Figaro* from 1901 till his death, 25th May 1903. Among his witty and satirical books are *John Bull and his Island* (1883); *John Bull's Womankind* (1884); *The Dear Neighbours* (1885); *Friend Macdonald* (1887); *Jonathan and his Continent* (1889); *Jacques Bonhomme* (1890); *Her Royal Highness Woman* (1901).

Blount, CHARLES (1654-93), a London deist, wrote *Anima Mundi*, a translation of Apollonius Tyaneus, *Great is Diana of the Ephesians*, *Janua Scientiarum*, and a *Vindication of Learning*.

Blount, THOMAS (1618-79), a Herefordshire country gentleman and zealous Catholic, wrote over a dozen works, the best known being *Ancient Tenures of Land and Jocular Customs of some Manors* (1679; new ed. 1815).

Blouse, the French name for a loose, sacklike over-garment somewhat answering to the English smock-frock. France is pre-eminently the country of blouses, ordinarily blue, worn not only by the country-people, but by workmen in towns.

Blow, JOHN, composer, born about 1648, became organist of Westminster Abbey in 1669, and of the Chapel Royal in 1676. For the stage he wrote a masque, *Venus and Adonis*, in which Mary Davis sang the part of Venus before Charles II.; and he was author of many birthday, New Year, and St Cecilia odes, about one hundred anthems, and fourteen services. His contemporaries thought him the 'greatest master in the world' in organ playing, and unprejudiced critics now consider his music in many respects in advance of his age, and as displaying great power and individuality. He died 1st October 1708.

Blow-fly, or FLESH-FLY (*Sarcophaga carnaria*), an insect of the order Diptera ('two-winged'), (q.v.), and of the large family Muscidae, of which the common House-fly, Blue-bottle (q.v.), &c. are familiar examples. It is very similar to these in general appearance; the body is hairy, the expanse of its wings about one inch, the face silky and yellow, the palps black, the thorax gray with three black stripes, the abdomen of a shining blackish brown, which, in



Blow-fly.

certain points of view, assumes a bluish tint, chequered with glittering yellowish spots. One of the distinguishing characters of the genus is, that the eyes are widely separate in both sexes, but in colour, hairiness, and shape of abdomen the males and females differ slightly. The multiplication is as usual rapid (one female may produce 20,000 larvæ); some species produce their young alive (viviparously); the larvæ feed (as the generic name suggests—Gr. *sarc*, 'flesh,' *phagō*, 'I eat') on the flesh of living or dead animals; the insect passes the winter in the pupa stage. The adults are common in Britain on heaths, in gardens, copses, &c.; and the larvæ are to be found feeding upon meat, the carcasses of animals, sometimes upon living earthworms, and too frequently upon sheep, of which it is one of the most grievous pests, requiring the constant attention of the shepherd during most of the summer and autumn. Some districts are more infested with it than others; it is particularly troublesome in the fenlands of England. Unless the maggots are removed, they eat into the skin, the sheep suffer great torment, and soon die. At first they may be removed by shaking them out of the wool, into which dry sand is then abundantly sprinkled; but if they are very numerous, a mercurial ointment or wash of corrosive sublimate is applied; and when the skin is much broken, the wool is clipped away, an ointment of tar and grease is used, and a cloth sewed over the part.

Another of the numerous species of this genus, common in Britain, is *S. mortuorum*, so named from its frequenting burial-vaults and laying its ova on corpses. It is very similar to the blow-fly, but the abdomen is of a shining steel blue, and the palps, feelers, and head are reddish brown. There

are altogether about 50 European species of *Sarcophaga*.

Blowing-machines. The earliest blowing-machine was, doubtless, some form of the common bellows, the idea of which is supposed to have been derived from the lungs. A very primitive form of this instrument is still in use in some Eastern countries, consisting simply of the skin of some animal sewed into a rude bag with a valve and nozzle.

Bellows.—The domestic bellows are worked by drawing the boards apart, when air is sucked in by the valve, to replace the vacuum which would otherwise be formed; and then, when the boards are being closed, the valve, which only opens inwards, is shut by the compressing of the air; so that the latter, having no other escape, is forced out at the nozzle.

The great fault of the common bellows is, that it gives a succession of puffs, and not a continuous blast. One remedy for this was to use two bellows, so that one was blowing while the other was filling; but it was afterwards found that the double-bellows secured a still more uniform blast. This machine, shown in fig. 1, is merely the common bellows with

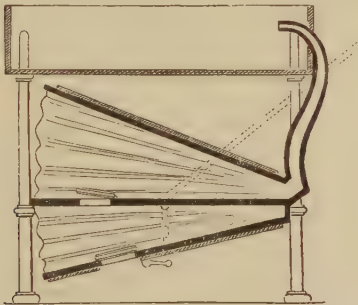


Fig. 1.—Section of Double-bellows for a Portable Forge.

a third board of the same shape as the other two placed between them, so as to form two chambers instead of one. The middle board is fixed, and both it and the lower one have valves placed in them opening inward. A weight on the lower board keeps the under chamber filled with air; and when this board is raised by a lever or otherwise, the air which it contains is forced into the upper chamber. The exit-pipe is attached to the latter, and a weight is placed on the upper board sufficiently heavy to press the air out in a continuous stream, the continuity being maintained by the large quantity of air always present in the upper chamber, and the uniform pressure of the weight. Even with the double-bellows, however, the blast is not quite regular.

Bellows made entirely of wood except the nozzle, first made in Germany in the 16th century, are in use in some continental countries, but they are only a modification of the common bellows.

The Chinese have a very simple form of bellows, shown in fig. 2, which is not only interesting in



Fig. 2.—Chinese Bellows.

itself, but also because its action is almost the same as the blowing-engine. It is merely a square chamber of wood, with a close-fitting piston, which, when drawn from the nozzle, opens the valves, *v, v*, to admit air, and when pushed in

the opposite direction, shuts these valves, and forces the air out by the nozzle.

Blowing-engines.—For blast-furnaces and for Bessemer steel converters, blowing-engines of large capacity are required. In the United States, where it is customary to work the blast-furnaces so as to produce a greater output of molten iron per diem than in Great Britain, the quantity of air needed for a full-sized blast-furnace varies from 40,000 to 50,000 cubic feet per minute, and the blowing-engines must be capable of delivering this volume of air against a resistance-pressure as great as 25 lb. per square inch, though in the normal working of the plant the pressure will not exceed 15 lb. per square inch. In Great Britain the air-supply required for a full-sized blast-furnace is about 25,000 cubic feet per minute, and the delivery-pressure is about 8 or 9 lb. per square inch. For Bessemer converters the quantity of air needed per minute is very much less, but a pressure as great as 2½ atmospheres is often necessary.

Originally all blowing-engines were of the reciprocating type and steam driven, but in 1899 large gas-engines began to be built, using blast-furnace and coke oven waste gases for their motive-power, for driving blowing-machines and dynamos for generating electric energy (see *Journal of the Iron and Steel Institute*, 1906); and about 1910 the turbo-blower, driven direct by steam-turbines, was brought into use.

The reciprocating type, in addition to the steam or gas engine cylinders, consists in its simplest form

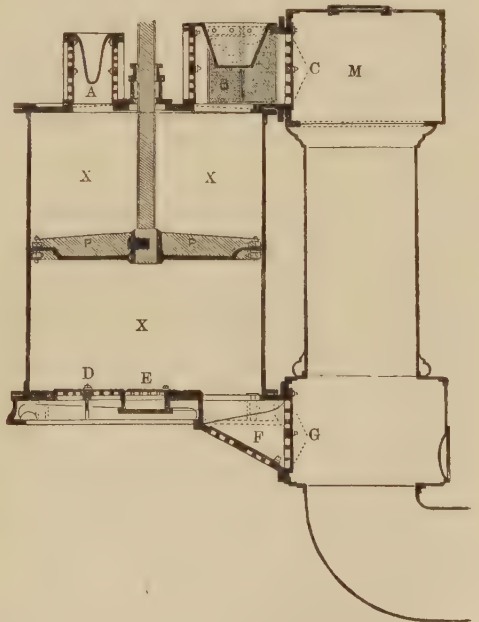


Fig. 3.—Section of a Blowing-cylinder.

(fig. 3) of an air-cylinder, with suction and delivery valves on each of the two cylinder-covers, and an air-tight piston which reciprocates to and fro in the cylinder, the piston-rod in general being direct coupled to the piston-rod of the steam or gas engine; as a result of the to-and-fro motion of the piston, air is alternately inhaled and expelled at each end. The inlet-valves on the top cover are lettered in the fig. A and B (three sides only of this box), those on the lower cover, D, E, and F, while the outlet-valves on the upper cover are on the fourth side of the box, marked C, and on the lower cover, G. The

valves consist of numerous openings, with leather flaps, which normally lie against the openings, but can be forced off the openings when the air-pressure on the outer face exceeds that on the inner face in the case of the inlet-valves; in the case of the delivery-valves, when the pressure on the cylinder becomes greater than that in the air-main, M. If, for example, the piston, P, were at the top of its stroke, and began to descend, it tends to cause a vacuum above it, and the inlet-valves A and B at once open inwards, admitting air from the atmosphere to fill up the space above the piston. Simultaneously the air in the cylinder below the piston is gradually compressed until its pressure rises to that in the blast-main, M, whereupon the outlet-valves G open, and all the air which originally filled the cylinder below the piston is forced out at the blast-pressure into the main, M. The reverse action takes place as the piston, P, returns from the bottom to the top of the cylinder, the inlet-valves D, E, F now opening, while the outlet-valves G and the inlet valves A and B at once close, and when the pressure above the piston again reaches that in the main the outlet-valves C open. These air-cylinders are of large diameter, and the pistons have a long stroke; for example, to supply four blast-furnaces in recently reconstructed works in the Midlands five Galloway vertical steam-engines were installed, having 90-inch diameter blowing-cylinders and each capable of delivering 20,000-25,000 cubic feet of free air per minute against a pressure of 8 to 9 lb. per square inch. In another recent plant two blowing-engines were installed, each capable of delivering 25,000 cubic feet of free air per minute against a pressure of 8 lb. per square inch, these blowing-engines being operated by three double-acting Korting gas-engines deriving their motive-power from blast-furnace waste gases; in this case a steam-driven blowing-engine was installed as a stand-by in case of temporary failure of any of the rest of the plant.

Turbo-blowers, since their introduction in 1910, have been extensively employed both for blast-furnaces and for Bessemer plant. They have certain distinct advantages over reciprocating blowing-machines: they are simpler in design, and for the same unit of capacity they are lighter in weight, take up less floor-space, and require less massive foundations; they in addition involve less original capital outlay, and are cheaper in maintenance. They deliver the air free from the pulsations, almost inseparable with reciprocating blowers, and their one defect, which proved troublesome when they were first introduced, that the volume of air delivered varied not only with the number of revolutions of the engine, as is the case with the reciprocating type, but also with variations in the pressure on the delivery side, has been got rid of by the employment of a blast-gate (butterfly-valve) in the suction-pipe between the air-governor and the air-compressor. They are usually driven direct by steam-turbines, and can, therefore, run at a very high speed up to nearly 3000 revolutions per minute.

The turbo-blowers built by the British Thomson-Houston Co. can deliver 40,000 cubic feet of free air per minute at a delivery-pressure of 25 lb. per square inch when running at 2740 revolutions per minute; they are coupled direct, through a flexible coupler, to a high-pressure multi-stage Curtis steam-turbine. In another case the three turbo-blowers, each driven by a high-pressure steam-turbine, were capable, when running at 2300 revolutions per minute, of delivering 30,000 cubic feet of free air per minute against a pressure of 8 lb.; the B.H.P. of the steam-turbine being

1280, and the steam consumption 13.9 lb. per B.H.P. hour. It is possible to use a combined set of turbo-blower and turbo-compressor to deliver air at a pressure of 12 lb. per square inch for blast-furnace work, and also air at a pressure of 30 lb. per square inch for Bessemer converters. The blower works when required to deliver air at the higher pressure as a two-stage compressor, and when a lower air-pressure is needed the two stages run parallel, delivering into the same air-main.

As far back as 1904 Gayley showed that considerable economy in coke consumption could be obtained by desiccating the air before it was delivered to the furnace; many plants of various types have been put into operation for this purpose, and though they have in some cases been given up on the ground that the economy obtained was not commensurate with the expense of erecting and running the plant, they have on the whole justified their use, especially since they allow the temperature of the hot blast to the furnace to be raised from the limiting temperature of about 1450° F., possible with natural air, to as high as 1600° F., without causing irregularities in the working of the furnace.

All blowing plant for blast-furnace work should have powerful and efficient governing devices, and the driving mechanism should have a good reserve of working-power to allow for possible drop in steam-pressure in the case of steam-plant, or in the heating value of the waste gases when gas-engines are used.

Fans.—The centrifugal fan is another machine for producing blasts of air. It is employed for such purposes as the melting of cast-iron in cupolas in foundries, and for smiths' forge fires, and for forced draught for steam boilers. It is also used for extracting foul air from mines, public buildings, and ships. In the case of coal-mines they are often of very considerable size (see VENTILATION).

A common type of blast fan is shown in fig. 4. It consists of a central drum, A B, which is fitted with a series of curved blades revolving within a casing; air enters through holes in the centre of

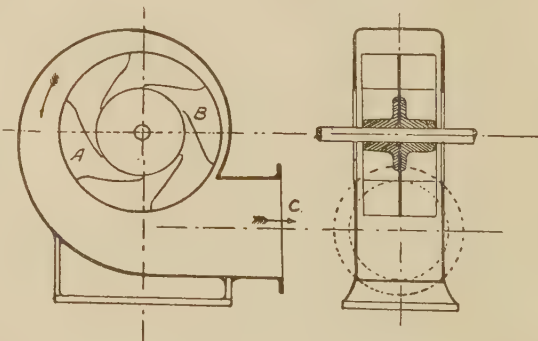


Fig. 4.—Blast Fan.

each of the sides of the drum, and is finally discharged through the outlet, C. A fan with a few simple blades will in ordinary practice prove most efficient, provided that the design of the shape of blades and dimensions of the casing have been properly arranged for the class of work the fan has to do. The number of blades varies in different types of fans, which run at speeds varying from 700 to 1800 revolutions per minute. They are often, especially in the case of fans for ventilating buildings, driven direct by electric motors. Such fans are small in diameter, seldom exceeding 3 feet, and the pressure of the fan-blast is small, only a few inches of water; this compression alone enables the fan to do useful work in overcoming resistance,

but the velocity energy of the stream of air is equally important in ventilation work.

(For experimental investigations as to efficiency of various types of fans, see *Minutes Proc. Inst. C. E.*, vol. cxxiii. p. 272; *Proceedings of Inst. Mech. Eng.*, 1897, p. 439, &c.)

Rotary Pressure Blowers.—These are machines introduced in comparatively recent years. They act by regular displacement of the air at each revolution, since their pistons or drums closely fit their cases. In this respect they differ from fans, because, although there were no outlet for the blast, a fan could be kept revolving, but in such a case a pressure blower would stop. The rotary blower by Roots of Connersville, Indiana (fig. 5),

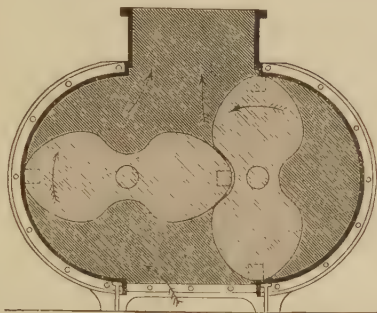


Fig. 5.—Roots's Rotary Blower.

is one of the best known, and is now very largely used for producing blasts in metallurgical operations, as well as for other purposes, in America and Europe. A pair of horizontal shafts traverse a case of the form of two semi-cylinders, separated by a rectangle equal in depth to the diameter of the semi-cylinders, and in width to the distance between the centres of the shafts. These shafts carry a pair of solid arms or pistons, the relative positions of which are maintained by external gearing at both ends provided with safety coverings. Each has a section somewhat resembling a figure of eight, and their action, as they revolve, takes the air in by an aperture at the bottom of the machine, and expels it with considerable pressure, if required, at the top. It gives a much greater pressure of blast than is attainable by the fan.

The determination of the true shapes of the two solid arms or pistons is a similar problem to that of determining the profiles of the teeth of two toothed wheels which have to mesh with one another, and to transmit a constant velocity ratio; the solid arms must, in fact, while sliding over one another, transmit the same velocity ratio as would be transmitted by their corresponding pitch circles. The object of the pistons is to preserve contact, the external gears transmitting the necessary forces from the one to the other.

Blowitz, HENRI GEORGES DE (1825–1903), a Bohemian Jew, *Times* correspondent in Paris.

Blowpipe, a small instrument used in the arts for glass-blowing and soldering metals, and in analytical chemistry and mineralogy, for determining the nature of substances by the action of an intense and continuous heat. Its utility depends on the fact, that when a jet of air or oxygen is thrown into a flame, the rapidity of combustion is increased, while the effects are concentrated by diminishing the extent or space originally occupied by the flame.

The blowpipe generally consists of a conical tube of metal, about 8 inches long (see fig.), closed at the wider or lower end, but open at the narrow or upper end, which latter constitutes the mouthpiece, and

is turned over to admit of the lips closing perfectly round it. Near the lower end, a small tube,

fitted with a finely perforated nozzle, *a*, is inserted in the large tube—the space below being intended as a chamber for condensing the moisture of the breath, and through this nozzle, a fine current of air can be projected against the flame experimented with.



Blowpipe.

The use of the mouth blowpipe, so as to sustain a prolonged steady blast, requires some skill, and is at first very fatiguing to the learner. In breathing, the manipulator involuntarily closes the back of the mouth, retaining in the expanded cheeks sufficient air to last till the lungs have been replenished through the nose. Where high temperatures are required mechanical blowpipes are resorted to.

When a current of air from the blowpipe is directed against a candle or gas-jet, the flame almost entirely loses its luminosity, owing to the perfect combustion of the gases evolved from the source of heat, and is projected in a lateral direction, as a long pointed cone, consisting of three distinct parts. The first or central cone is of a dark-blue colour, and there the combustion is complete from the excess of air thrown in from the small nozzle. The second cone, or that immediately surrounding the first, is somewhat luminous; and here the oxygen being insufficient for the combustion of the carbon, any metallic oxide subjected to the action of this portion of the flame is deprived of its oxygen, and reduced to the condition of metal; for this reason the luminous cone is generally termed the *reducing flame* of the blowpipe. Beyond the second cone, or where the flame comes freely in contact with the atmosphere, and abundance of oxygen is present to effect complete combustion of the gases, is a third, or pale yellow envelope, containing excess of atmospheric air at a very high temperature, so that a portion of metal, such as lead or copper, placed at this point, becomes rapidly converted into its oxide; this outer part of the flame is on this account called the *oxidising flame* of the blowpipe.

Substances under examination before the blowpipe are generally supported either on wood-charcoal or platinum—the latter in the condition of wire or foil. In applying the blowpipe test, the body to be examined is either heated alone, or along with some flux or fusible substance; this being added, in some cases, for the purpose of assisting in the reduction of metals from their ores and other compounds: in others, for the production of a transparent glassy bead, in which different colours can be readily observed. When heated alone, a loop of platinum wire, or a piece of charcoal, is generally employed as a support; the former when the colour of the flame is to be regarded as the characteristic reaction, the latter when such effects as the oxidation or reduction of metallic substances are to be observed.

The following are examples of the difference in colour communicated to the flame by different

substances: Salts of potash colour the flame violet; soda, yellow; lithia, purplish red; baryta, yellowish green; strontia, carmine; lime, brick red; compounds of phosphoric acid, boracic acid, and copper, green. The commonly occurring metallic oxides reducible by heating on charcoal alone in the inner flame of the blowpipe are the oxides of zinc, silver, lead, copper, bismuth, and antimony; the principal ores not so reducible are the alkalis and alkaline earths, as also the oxides of iron, manganese, and chromium. The fluxes generally used in blowpipe experiments are either carbonate of soda, borax (baborate of soda), or the ammonia-phosphate of soda, otherwise called *Microcosmic Salt* (q.v.). The carbonate of soda, when heated on platinum-wire in the oxidising flame, forms with silica a *colourless glass*; with oxide of antimony, a *white bead*, &c. The following metals are reduced from their compounds when heated with carbonate of soda on charcoal in the inner flame of the blowpipe: viz. nickel, cobalt, iron, molybdenum, tungsten, copper, tin, silver, gold, and platinum. When compounds of zinc, lead, bismuth, arsenic, antimony, tellurium, and cadmium are similarly treated, these metals are also formed, but being volatile, pass off in vapour at the high temperature to which they are exposed.

Borax, as a flux, is generally mixed with the substance under examination, and placed on platinum-wire. When thus heated in either of the flames, baryta, strontia, lime, magnesia, alumina, and silica, yield *colourless beads*; cobalt gives a *fine blue colour*; copper, a *green*, &c. With microcosmic salt, the results obtained are generally similar to those with borax, and need not be specially mentioned, as the test is applied in the same way. The blowpipe has been long used by goldsmiths and jewellers for soldering metals, by glass-blowers in fusing and sealing glass-tubes, &c., by chemists in qualitative, and even quantitative, analysis—the advantages being the small quantities required, and rapidity of working.

The *oxyhydrogen blowpipe* is an arrangement by which a jet of oxygen and hydrogen, in the proportions to form water, is ignited and directed against any object. The most intense heat is produced, most of the metals being volatilised when placed in it, and even the diamond changes into ordinary carbon and is burned when exposed to its flame. When a cylinder of quicklime is heated by it, a most dazzling light is produced, rivalling the electric light in brilliancy, and known as the *Drummond Light* (q.v.).

The *oxyacetylene blowpipe* has been more recently introduced, and gives a more intense heat than the oxyhydrogen. A special type of burner is used, fed from a cylinder of acetylene gas dissolved in acetone. This blowpipe is of great use in welding steel, and making repairs in steel machinery.

Blowpipe, a kind of weapon much used by some of the Indian tribes of South America, both in war and for killing game. It consists of a long straight tube, in which a small poisoned arrow is placed, and forcibly expelled by the breath. The tube or blowpipe, called *gravatana*, *pucuna*, &c., is 8 to 12 feet long, the bore not generally large enough to admit the little-finger. It is made of reed or of the stem of a small palm. Near Pará, it is in general very ingeniously and nicely made of two stems of a palm (*Iriartea setigera*) of different diameters, the one fitted into the other. In some places the inner tube is formed of the thin stem of a reed, protected by an outer one of this palm. A *sight* is affixed to it near the end. The arrows used in that district are 15 to 18 inches long, made of the spines of another palm, sharply pointed, notched so as to break off in the wound, and their points covered with *Curari* (q.v.) poison. A little soft

down of the silk-cotton tree is twisted round each arrow, so as exactly to fit the tube. In Peru, arrows of only 1½ to 2 inches long are used, and a different kind of poison seems to be employed. An accidental wound from one of these poisoned arrows not infrequently proves fatal. In the hand of a practised Indian, the blowpipe is a very deadly weapon, and particularly when directed against birds sitting in the tops of high trees. As his weapon makes no noise, the hunter often empties his quiver before he gathers up the game, and does more execution than an English sportsman could with his double-barrelled fowling-piece. In Borneo, the Dyaks have a similar blowpipe called a *sumpitan*. It, however, has an iron spear-head tied on the end so that it can be used as a spear. It is employed both in war and in hunting. Small arrows, which have on their end a piece of pith adapted to the bore of the tube, are used. These are pointed with sharp fish-teeth and poisoned with upas. They are blown with great accuracy; and if the upas-juice is fresh, a wound from an arrow, fired at a distance of 40 yards, proves fatal to man. See POISON.

Blubber. See WHALE.

Blücher, GEBHARD LEBERECHE VON, Prince of Wahlstadt, Field-marshal of Prussia, was born at Rostock, in Mecklenburg-Schwerin, December 16, 1742. In 1757, shortly after the commencement of the Seven Years' War, he joined a regiment of Swedish hussars, and in his first action was taken prisoner by the Prussian hussars, whose colonel persuaded him to exchange out of the service of Sweden into that of Prussia, and gave him a lieutenancy. He attained the rank of captain, but his dissipated habits lost him the favour of his colonel, who promoted a younger officer over his head, and Blücher, in 1772, left the service in disgust. He retired to his estate of Grossradow, in Pomerania, and for fifteen years devoted himself to farming. In 1793, having returned to the army, he fought, as colonel of hussars, against the French on the Rhine, evincing great genius as a leader of cavalry. The breaking out of the war of 1806 led him, as lieutenant-general, to the battle of Auerstädt. He, with the greater part of the cavalry, occupied the left flank of the Prince of Hohenlohe's army in the retreat to Pomerania. Blücher himself marched into the territory of the free town of Lübeck, and hastily fortified the city; but the French took it by storm, and he was forced to surrender at Ratkau, whither he had escaped with a few troops. A fortnight after, he was exchanged for the French general Victor, and was sent, at the head of a corps, to assist in the defence of Stralsund. After the peace of Tilsit, he was employed at Königsberg and Berlin, and subsequently became commander in Pomerania. When the Prussians at last rose in opposition to France, Blücher was appointed to the chief command in Silesia, and at the battles of Lützen, Bautzen, and Haynau, he displayed heroic courage. At the Katzbach, he defeated Marshal Macdonald, and cleared Silesia of the enemy. In vain did Napoleon himself attempt to stop the 'old captain of hussars,' as he called him, in his victorious career.

In the battle of Leipzig he won great advantage over Marshal Marmont at Möckern, October 16, 1813; and on the 18th, in conjunction with the crown prince of Sweden, he had a great share in the defeat of the French, his troops being the first to enter Leipzig, the next day. In January 1814 he crossed the Rhine, and after winning the battle of La Rothière, pressed forward to Paris; but his scattered corps were routed by Napoleon, and he fought his way back to Châlons with great loss. On the 9th March, however, he defeated Napoleon at Laon; and at the end of the month he again

advanced towards Paris, although sickness compelled him to make the journey in a wagon. The day at Montmartre crowned the brilliant deeds of this campaign, and, on the 31st March, Blücher entered the French capital. Frederick-William III. created him Prince of Wahlstadt, in remembrance of the victory at the Katzbach, and gave him an estate in Silesia. In England, whither he followed the Allied Sovereigns, he received the freedom of the city of London, and the university of Oxford conferred on him the degree of Doctor of Laws. After Napoleon's return in 1815, Blücher once more assumed the general command, and promptly led the army into the Netherlands. On June 16, 1815, he suffered a severe defeat at Ligny, but he personally rallied his scattered troops, and Wellington's victory at the battle of Waterloo was completed by his timely appearance on the field. Blücher despatched his Prussians after the fleeing enemy, and the pursuit lasted all through the night. Declining the offered truce, he marched again against Paris, and on the second taking of that city manifested a strong desire to retaliate on Paris the spoliation that other capitals had suffered; but he was held in check by the Duke of Wellington. In order to reward Blücher's services, Frederick-William III. created a new order, the badge of which consisted of an iron cross surrounded by golden rays. In 1819 a colossal bronze statue was erected in his honour in his native town, and others were afterwards raised in Breslau and Berlin. He died September 12, 1819, after a short illness, at his estate of Krieblowitz, in Silesia. 'Marshal Forwards' was not a great tactician, his victories being due mainly to his dash and energy. In speech and behaviour he was rough and uncultivated; his character was a noble compound of frankness, valour, integrity, and loyalty, and he remains a German hero. His statue at Breslau is Rauch's masterpiece.

See *Lives* by Forster (new ed. 1887), Scherr (new ed. 1887), and E. F. Henderson (1911), and books about the Waterloo campaign. The story that, looking at London, Blücher exclaimed, 'What a place to plunder!' seems to rest on a mistake. What he said was, 'Was für Plunder!' ('What rubbish!'), with reference to the mean streets he saw about him.

Blue. The blue pigments in common use by artists are few in number, and consist of native and Artificial Ultramarine, Cobalt, Indigo, and Prussian Blue (q.v.). Genuine ultramarine, prepared from the mineral lapis lazuli, and ordinary cobalt blue, sold for artists' work, are permanent colours. They are used either alone, or mixed with other pigments, chiefly for skies and distances in landscape; and by themselves, or to make up grays and other mixed tints in figure-painting. Owing to the exceptionally high price of real ultramarine, the artificial colour, which is of doubtful permanency, is usually substituted for it. Prussian blue and indigo are highly useful colours, since it is only these that yield dark blues, and only from them, mixed with yellows or browns, that strong greens can be obtained. It is unfortunate accordingly that both are more or less fugitive. All the blues above named are used both in oil and water-colour painting, but indigo less than the others in oil, since it is most apt to fade in that medium.

A number of different names are used in commerce for what is essentially the same pigment, or for pigments closely resembling one another. The following statement gives some explanation of these.

Cobalt blues are mixtures of cobalt with earthy or metallic bases, which have been subjected to the action of heat, and have received the following names: Cobalt blue, cerulean blue, royal blue,

Dumont's blue, Saxon blue, Thénard's blue, Leithner's blue, Hungary blue, Zaffre or enamel blue, Vienna blue, azure blue, and Paris blue. The last name is also applied to a Prussian blue, and azure is also given to a variety of ultramarine blue.—*Smalt* is a powdered cobalt glass used in illumination and flower-painting.—*Artificial ultramarine* is also called French ultramarine, French blue, new blue, and permanent blue. Coarse qualities of this colour are largely used by house-painters.—*Intense blue* is a refined indigo.—*Prussian blue* (sesquiferrocyanide of iron) is otherwise named Berlin blue, Paris blue, and ferrocyanide of iron. The name Paris blue is also given to a cobalt colour.—*Antwerp blue* is a variety of Prussian blue made lighter by the addition of an aluminous base, and not so permanent.—*Blue ochre* (hydrated phosphate of iron) is a subdued permanent blue, but not much employed.—*Blue verditer* is a hydrated oxide of copper which changes and ultimately blackens by time. It is used in distemper work and paper-staining.

Blue was worn as a distinctive colour by the Scottish covenanters, and is in some places used by Conservatives. The traditional Whig colour was blue also, or blue and buff. *Navy blue* is a dark blue. Dark blue is the Oxford colour, light blue the Cambridge one.

For Blue Dyes, see DYEING; and for blue colours used in the manufacture of GLASS and POTTERY, see these heads. *Blueing* is a name for indigo or any material used for giving a bluish colour to linen. See also TEMPERING.

Bluebeard, the hero of a well-known nursery tale, so named from the colour of his beard. The story is widely known in Western Europe, but the form in which it has become familiar in England is not an independent version, but a free translation of that given by Perrault in his famous *Contes* (1697). In this story Bluebeard is a seigneur of great wealth, who marries the daughter of a neighbour in the country, and a month after the wedding goes from home on a journey, leaving his wife the keys of his castle, but forbidding her to enter one room. She cannot resist her curiosity, opens the door to find the bodies of all Bluebeard's former wives, and at once sees the fate to which she herself is doomed. Bluebeard on his return discovers, from a spot of blood upon the key, which would not be cleaned off, that his wife had broken his command, and tells her that she must die. She begs for a short respite to commend herself to God, sends her sister Anne to the top of the tower to look round if any help is near, and finally is just on the point of having her head cut off, when her two brothers burst in and despatch Bluebeard.

Nothing is more common in folk-tales than stories of forbidden rooms, the entrance into which is at once followed by severe punishment. In the eastern stories, according to Mr Clouston, the room does not usually contain anything very horrifying, unlike most of the western examples of which the story of Bluebeard is a type. A very close parallel to the classical form of the story is offered by a Swabian tale in Grimm's collection; so close, indeed, that in later editions than the first, Grimm omitted it as probably a direct loan from the French. Greek, Tuscan, Icelandic, Estonian, Gaelic, and Basque versions of the story occur, with varying circumstances of detail, but the main situations identical. Bluebeard is usually a monster or ogre, and lives fittingly in the gloom of forest or cavern—the only really essential detail that has dropped out of the typical story. In one group the monster is the devil, and the forbidden door closes the entrance to hell. In many stories the heroine is the youngest of three or more sisters who have been less lucky, and sometimes, as in one of Camp-

bell's Gaelic variants, she is able to restore them to life. In Campbell's other version, as in the Basque story, it is the heroine herself who cuts off the monster's head.

In the face of such a wide geographical range and self-evident antiquity it is as idle to look for an historical 'Bluebeard' in Gilles de Laval, sire de Rais (see RETZ), as it would be to find him in Henry VIII., who was so unfortunate with his wives.

Use has been made of the story by Tieck in his *Phantastus*, by Anatole France in *Les Sept Femmes de la Barbe Bleue* (1909), by Grétry, Dukas, Reznicek, Bartók, in operas. See 'The Forbidden Chamber' by Sidney Hartland in *The Legend of Perseus* (1894-96), Andrew Lang's edition of Perrault's *Contes* (1887), and Vizetelly's *Comorro the Cursed and Gilles de Rais* (1902).

Blue-bell is the English name of the common wild hyacinth (*Scilla festalis* or *S. nutans*; see SQUILL, HYACINTH). The 'blue-bells' familiar alike in the everyday rural associations and in the poetic literature of Scotland are the flowers of *Campanula rotundifolia*, commonly called Harebell in England (see CAMPANULA, HAREBELL).

Bluebird, **BLUE WARBLER**, **BLUE RED-BREAST**, or **BLUE ROBIN** (*Sylvia* or *Sialia sialis*), an American bird, which, from the confidence and familiarity it displays in approaching the habitations of men, and from its general manners, is much the same sort of favourite with all classes of people in the United States as the redbreast is in Britain. Except in the southern states, it is chiefly known as a summer bird of passage, appearing early, however, as a harbinger of spring, and visiting again 'the box in the garden, or the hole in the old apple-tree, the cradle of some generations of ancestors.'



Bluebird (*Sylvia sialis*).

Their soft agreeable note strikes one of the hours on the living timepiece of the seasons, and has been beautifully called by Burroughs the 'violet of sound.' They are celebrated in American poetry; thus Lowell speaks of

The bluebird, shifting his light load of song
From post to post along the cheerless fence.

Few American farmers fail to provide a box for their nest. In size the bluebird rather exceeds the redbreast, which, however, it much resembles in general appearance. Its food is also similar. The upper parts of the bird are of a rich sky-blue colour, the throat and breast are reddish chestnut, and the belly white. The female is duller in colours than the male. It lays five or six pale-blue eggs, and has two or three broods in the season. The male is remarkably attentive to his mate, and both exhibit extraordinary courage in driving away intruders from the vicinity of their nest. A hen, with her brood, has been seen to flee from the attacks of an

enraged and pugnacious bluebird. The bluebird is known as an inhabitant of the Bermudas, Mexico, the West Indies, Guiana, and Brazil.—In the western and in the more northern parts of North America its place is taken by nearly allied and very similar species. The name Bluebird is also applied to a number of other birds, as the Indian *Irene puella* (a member of the bulbul family or *Pycnonotidae*), and the sooty albatross (see ALBATROSS). Maeterlinck's Blue Bird is, of course, outside the classification of ornithologists.

Blue Blanket, the banner of the Edinburgh craftsmen, traditionally connected with Pope Urban II., was granted by James III. about 1482, when Edinburgh helped him out of his money difficulties. 'If in anything they be controuled,' says the *Basilicon Doron*, 'up goeth the blue blanket.' See FLAG (Standard).

Blue-books, the name popularly applied to the reports and other papers printed by parliament, because they are usually stitched up in blue paper wrappers. Some departments, however, issue their proceedings in drab, and some in white, covers. The practice of printing, and to some extent publishing, the proceedings of the House of Commons began in the year 1681, when disputes ran high on the question of excluding the Duke of York from the succession to the throne. It was stated that false accounts of the transactions were circulated, and, as a remedy, Sir John Hotham moved that the votes and proceedings of the House be printed. The motion, after considerable discussion, was carried. The documents printed by the House of Commons grew gradually in bulk and variety, until they reached their present extent. In 1836 the House adopted the practice of selling their papers at a cheap rate, and has since that date gradually increased the facilities offered to the public for acquiring parliamentary papers. Since August 1886, under the authority of the President of the Board of Trade, a most useful journal has been issued each month by that department. It contains in addition to its official notices much valuable information from British, colonial, and foreign sources relating to the trade of the world. The publications issued under the superintendence of His Majesty's Stationery Office include Papers and Bills of the House of Lords, Bills of the House of Commons, Reports and Papers of the House of Commons, and Papers by Command. The chief contents of these papers are the votes and proceedings of the House; the bills read in their several stages; the estimates for the public services of each year; the accounts of the expenditure of the moneys voted in the previous year; any correspondence or other documents which the ministry may voluntarily, or at the demand of the House, produce, as connected with a question under discussion; reports of committees of inquiry appointed by the House; reports of commissions of inquiry appointed by the crown; and annual reports by the permanent commissions and other departments of the government, stating their proceedings during the year. The blue-books of a session, when collected and bound up, now fill many thick folio volumes. Nothing can seem more hopelessly chaotic than those of a few sessions huddled together unarranged. It deserves to be known, however, that they are all printed according to a peculiar sequence, which enables the whole papers of a session to be bound up in such an order that any paper can be found by consulting an ample index in the last volume. A *précis* of the contents also is now usually given at the beginning of each blue-book. In any library where the blue-books are preserved and properly bound up, the most trifling paper of any session may thus be found with ease; and it need hardly be said that with

much that is useless or unimportant, there is an enormous mass of valuable matter hidden in the blue-books. A treasury minute having reference to copyright in government publications provides that while no restrictions are put on their reproduction generally, the unauthorised publication of charts and ordnance maps is forbidden.

The official books of foreign governments corresponding to our blue-books are designated by the colour of their covers. The principal are: France, yellow; Germany and Portugal, white; Italy, green; and Spain, red. The United States government publishes a most valuable collection of reports on agriculture, manufactures, trade and commerce; the name blue-book is confined to the published lists of government employes and to the manuals of regulations for the navy; the foreign diplomatic correspondence is usually published in red.

Blue-bottle. See CORN-FLOWER.

Blue-bottle Fly (*Musca vomitoria*), an insect of the same genus with the common House-fly (q.v.). It much exceeds the latter in size, but is smaller than the Blow-fly (q.v.). The head is black, with rust-coloured cheeks, the thorax grayish, the abdomen blue, with a whitish shimmer, and with three black bands. It flies with a loud buzz. The expanse of wings is nearly one inch. It is abundant throughout Britain and Europe generally from spring to autumn, and deposits its eggs on flesh, for which purpose it often enters houses, having a remarkably delicate sense of smelling. The maggots are of very frequent occurrence on meat in summer, notwithstanding all care that can be taken.—*M. erythrocephala* is also called Blue-bottle.—A nearly allied species (*M. caesar*), the Green-bottle fly, is distinguished by its golden-green colour, and is also common in Britain, especially on excrement. The maggots develop from the egg in about twenty-four hours; the whole metamorphosis occupies about a month. *M. cornicina* is another common green-bottle. There are many other species. See FLY.

Blue Cardinal. See LOBELIA.

Blue-coat School, a name commonly given to Christ's Hospital (now at Horsham), and to similar schools in Bristol and elsewhere, the dress of whose scholars is a long dark-blue gown with a belt round the waist, and yellow stockings. Such dress is just that of boys in the first half of the 16th century. See CHRIST'S HOSPITAL.

Blue-eye (*Entomyza cyanotis*), a beautiful little bird, abundant and very generally dispersed in New South Wales, although not found in Victoria. It is one of the Honey-eaters (q.v.) or Honey-suckers, and is sometimes called the Blue-cheeked Honey-eater. It seeks its food almost exclusively among the blossoms and small leafy branches of gum-trees (Eucalypti), and finds it partly in insects and partly in nectar, though perhaps also in berries. It is a bold and spirited bird, of most elegant and graceful movements. Numbers are often seen together clinging and hanging in every variety of position, frequently at the extreme ends of the small branches.

Bluefields. See BLEWFIELDS.

Bluefish (*Pomatomus saltatrix* or *Temnodon saltator*), a fish of the family Serranidae, of a genus having no detached finlets, no isolated dorsal spines, and no lateral armature of the tail, two dorsal fins, the first of which is small, and two deeply-hidden spines in front of the anal fin. The only known species is abundant on the east coast of North America. It goes southwards in winter, migrates northwards in spring, and is widely spread in tropical and subtropical seas. The upper parts are of a bluish colour, the lower parts whitish, a

large black spot at the base of the pectoral fins. The mouth is crowded with teeth, the jaws are furnished with large ones. The bluefish preys on other fishes, such as the menhaden, and mackerel, the shoals of which it pursues. It is very swift, strong, and voracious. It sometimes attains a length of 3, or even 5 feet, and a weight of 14 lb. It is much esteemed for the table. It is often caught by trolling, as it bites readily at an object drawn swiftly through the water. It frequently ascends rivers even to fresh water.

Blue-gowns, the name commonly given to a class of privileged mendicants in Scotland. The proper designation of these paupers was the King's Bedesmen, or Beadsmen. In ancient times, a beadsman was a person employed to pray for another (see BEADS). From practices of this kind, there sprang up a custom in Scotland of appointing beadsmen with a small royal bounty, who ultimately degenerated into a class of authorised mendicants. Each of the beadsmen on his majesty's birthday received a gown or cloak of blue cloth, with a loaf of bread, a bottle of ale, and a leathern purse containing a penny for every year of the king's life. Every birthday, another beadsman was added to the number, as a penny was added to each man's purse. The most important part of the privilege was a large pewter badge, attached to the breast of the gown, which, besides the name of the bearer, had the inscription, 'Pass and Repass.' This inferred the privilege of begging, and bespoke the kindly consideration of all to whom the beadsman appealed for an alms or a night's lodging. The fictitious character of Edie Ochiltree, in Sir Walter Scott's tale of the *Antiquary*, is a fair sample of this ancient and picturesque fraternity. The practice of appointing beadsmen was discontinued in 1833, at which time there were sixty on the roll. The whole have since died out. The last beadsman drew from the Exchequer in Edinburgh his last allowance in May 1863.

Blue Grass (*Poa pratensis*) is a permanent grass found in Europe and North America. By reason of its creeping root-stocks it forms a dense turf, but is more valued for pasture than for cropping. The blue grass pastures of Kentucky, where it grows spontaneously, have long been celebrated. It is also called June grass. See GRASS, PASTURE.

Blue-jay (*Cyanocitta cristata*), a common North American bird of the Crow family, and occupying in the New World the place held by the jays (*Garrulus*) of the Old. In the United States the blue-jay is sometimes persecuted, sometimes protected, becoming as shy and cunning in the one case, as he is familiar and impudent in the other. They are mischievous birds, but devour large numbers of injurious caterpillars. The length of the bird is almost a foot; the colour is 'grayish purple above, black on the neck, lilac-brown to white below.' The common blue-jay has a wide distribution, and there are several other North American species. The long-tailed blue-jays belong to a rarer genus (*Xanthura*) found in Central and in South America. See JAY.

Blue John. See FLUOR-SPAR.

Blue Light. See BENGAL LIGHT.

Blue Mountains, a spur which juts out from the Main Dividing Range in New South Wales, west-north-west of Sydney. It is really the remains of an old sandstone tableland into which the Grose River on the north and the Cox on the south have eaten deeply, edging it with cliffs from 600 to 1000 feet in the sheer. The main road and railway to the inland plains run along the spur by a route discovered in 1813; the 'Zigzags,' by which the railway ascended and descended, are now both

done away with. The principal settlement is at Katoomba, 3300 feet high, but all along the line are scattered summer resorts for the people of Sydney. The Jenolan Caves (q.v.) are sometimes spoken of as in the Blue Mountains, but are thirty miles south-west in the heart of the Main Range. See also JAMAICA.

Blue Peter, a blue flag with a white rectangle in the centre, hoisted when a ship is about to sail.

Blue Pill (*Pilula hydrargyri*) is the most simple form in which mercury can be administered internally. It consists merely of two parts of mercury rubbed up with three parts of conserve of roses, till globules of mercury can no longer be detected; to this is added one part of powdered liquorice-root, so that a pill of three grains contains one grain of mercury. In cases of torpid condition of the liver or inflammation of that organ, blue pill is much used as a purgative, either alone or combined with some other drug, such as rhubarb. When it is given with the view of bringing the system under the influence of mercury (see SALIVA), small doses of opium should be added to counteract its purgative tendency, and the state of the gums watched carefully from day to day, so that the first symptoms of salivation may be noticed, and the medicine omitted. As a purgative, the common dose of blue pill is one or two pills of five grains each, followed by a purgative draught. But sensibility to the action of mercury varies with the individual. When one is taking blue pills, all sudden changes of temperature should be avoided, and neither they nor any other form of mercury should be given without good cause and without the greatest caution.

Blue Ribbon, a term applied to any great prize—as the 'Derby' stakes—from the blue ribbon worn by knights of the Garter.—*Blue Ribbon Army* was the name adopted, from the badge, by the association of total abstiners founded in 1878 by Mr Murphy in America, since 1883 known as the Gospel Temperance Union.

Blue Ridge. See APPALACHIANS.

Blue Roach. See AZURINE.

Blue Sky Laws, in the various American states, seek to prevent fraud in the selling of stocks.

Blue Slipper. See GAULT.

Blue-stocking, a name given to learned and literary ladies. The name is derived from a literary coterie formed in London about the year 1750, which included both men and women, and *Bas Bleus* is a French translation. But it has been much disputed whether the name came to be given because a male member, Benjamin Stillingfleet, habitually wore blue (or gray) worsted stockings, when black silk were *de rigueur*; or because one or more of the ladies followed the Duchesse de Polignac and the newest Paris fashion. Mrs Montagu was called 'the Queen of the Blue Stockings'; see an article in the *Quarterly Review* for January 1903, and Mrs E. R. Wheeler's *Famous Blue Stockings* (1910), which deals also with Mrs Delany, Mrs Chapone, Mrs Vesey, Elizabeth Carter, Hannah More, Fanny Burney, and Mrs Thrale.

Bluestone, or BLUE VITRIOL. See COPPER.

Bluethner, JULIUS FERDINAND (1824-1910), born at Falkenhain, near Merseburg, set up his famous pianoforte house in Leipzig in 1853.

Bluthroat, or BLUEBREAST (*Cyanecula suecica*), a beautiful and melodious bird, nearly allied to the nightingale. From its power of imitating the notes of other birds the Laplanders give it a name which signifies the bird of a hundred tongues. Another of its many names is *Luscinia suecica*, or Swedish Nightingale. It is

very little larger than a redbreast, and much resembles it, but has the throat and upper part of the neck of a brilliant light-blue, with a spot in the centre, which in some specimens is pure white, and in very old males is red. The females have less blue. Below the blue colour is a black bar, then a line of white, and again a broad band of bright chestnut. The bluethroat is well known as a summer bird of passage in many parts of Europe, from the Mediterranean Sea to the Arctic Ocean, but is very rare in Britain, only a few instances of its occurrence having been recorded. It is supposed to spend the winter in Africa. The bird is one of those known by the names of Becfin and Beccafico (q.v.), and unfortunately falls victim to epicure tastes.

Blue-wing, a kind of duck, either a sub-genus of *Anas*, or a special genus *Cyanopterus*. The latter title and the popular name refer to the conspicuous colour. The best-known species, the Common or Lunate Blue-wing (*Anas* or *Cyanopterus discors*), is generally called the Blue-winged Teal in the United States of America, where it is very abundant. Vast numbers spend the winter in the extensive marshes near the mouths of the Mississippi, to which they congregate both from the north and from the coast regions of the east; but the summer migrations of the species extend as far north as the 57th parallel, and it is plentiful on the Saskatchewan in the breeding-season. It breeds, however, also in the marshes of the south, even in Texas; and is common in Jamaica, where it is supposed to be not a mere bird of passage, but a permanent resident. In size it is rather larger than the common teal; in the summer plumage of the male, the upper part of the head is black, the other parts of the head are of a deep purplish blue, except a half-moon shaped patch of pure white before each eye; the prevalent colour of the rest of the plumage on the upper parts is brown mixed and glossed with green, except that the wings exhibit various shades of blue, the lesser wing-coverts being of a rich ultramarine blue, with an almost metallic lustre; the lower parts are reddish orange spotted with black; the tail is brown, its feathers short and pointed. The flight is extremely rapid and well sustained. The flocks are sometimes so numerous and so closely crowded together on the muddy marshes near New Orleans, that Audubon mentions having seen 84 killed by the simultaneous discharge of the two barrels of a double-barrelled gun. There are other species of blue-wing, also American; but this alone seems to visit the more northern regions. No member of the duck tribe is in higher esteem for the table, and it has therefore been suggested that the blue-wing is particularly worthy of domestication, of which it seems to be very easily susceptible.

Blum, ROBERT, born in very humble circumstances at Cologne in 1807, was secretary and treasurer of a theatre at Cologne, and subsequently at Leipzig, until 1847, when he established himself as bookseller and publisher. His leisure was devoted to literature and politics, and in 1840 he founded at Leipzig the Schiller Society, which celebrated the poet's anniversary, as a festival in honour of political liberty. When the revolutionary movement broke out in 1848, Blum was one of its most energetic leaders. He was elected one of the vice-presidents of the provisional parliament at Frankfurt, and as such ruled that turbulent assembly by presence of mind and a stentorian voice. In the National Assembly he became leader of the Left, and was one of the bearers of a congratulatory address from the Left to the people of Vienna, when they rose in October. At Vienna he joined the insurgents, was arrested, and was shot

on the 9th November. Blum was a man of strong character, great natural intelligence, and stirring eloquence. The news of his execution excited great indignation among the democrats in Germany, who, besides instituting commemorations for the dead, made an ample subscription for his widow and children. See the Life by his son (Leip. 1878).

Blumenbach, JOHANN FRIEDRICH, a very eminent naturalist, whose influence extended to almost all branches of natural science, was born at Gotha, 11th May 1752. He studied at Jena and Göttingen, and at Göttingen he became extraordinary professor in 1776, and ordinary professor in 1778. Here he lectured for nearly 60 years on natural history, comparative anatomy, physiology, and the history of medicine. In 1785, consequently before Cuvier, he made natural history dependent on comparative anatomy, and zoology in his hands first attained full scientific rank, the real relations of animals being definitely ascertained. His doctor's disputation, *De Generis Humani Varietate Nativa* (1775), raised the great question as to the unity of the human race; his *Institutiones Physiologicae* (1787), and other treatises, gave a decided impulse to scientific research. His *Manual of Natural History* (1780) went through 12 editions in 50 years. His *Manual of Comparative Anatomy and Physiology* (1804) was translated into almost all the principal languages of Europe. The natural history of man was always a favourite study; and his *Collectio Craniorum Diversarum Gentium*, commenced in 1790, and completed in 1828, gave to the learned world the result of his observations on the skulls of different races, of which he had an extensive collection (see SKULL, ETHNOLOGY). He published other valuable works on natural history, and many essays and papers. Both as a writer and a lecturer he was eminently successful. In 1788 and 1792 he visited England, where he met with a distinguished reception from the most famous naturalists. On the 19th September 1825, his friends and pupils in all countries celebrated the jubilee of his doctorate. In 1835 the increasing infirmities of age compelled him to resign his academical functions. He died on the 22d January 1840. See Marx's *Memoir* (1840), and the work *Göttinger Professoren* (1872).

Blumenthal, JACQUES (1829-1908), pianist, born in Hamburg, studied under Herz, and in 1849 went to London, where he was pianist to the queen, taught music, and composed many brilliant, pretty pieces and popular songs.

Blundell's School. See TIVERTON.

Blunden, EDMUND, one of the best of English 20th-century poets, was born in 1896, was educated at Christ's Hospital and Queen's College, Oxford, and fought in the Great War. His *Pastorals* (1916), and some other early volumes, were followed by *The Waggoner* (1920), in which accurate and sympathetic observation of nature was combined with craftsmanship of high accomplishment. *The Shepherd and other Poems of Peace and War* (1922) showed his qualities in greater maturity, and brought more of his own experience into his poetry. *The Bonadventure* (1922), the story of a voyage in a tramp steamer, proved him an accomplished writer of prose. With Alan Porter he edited Clare's poems in 1920.

Blunt, JOHN HENRY, D.D. (1823-84), theologian, born at Chelsea, was for some years engaged as a manufacturing chemist, but in 1850 entered the university at Durham. He held several minor preferments, till in 1873 he received the crown living of Beverstone, Gloucestershire.

Blunt, JOHN JAMES (1794-1855), divine, born at Newcastle-under-Lyme, in 1812 entered St John's College, Cambridge, graduated fifteenth

wrangler, and obtained a fellowship. A curate in Shropshire, then rector of Great Oakley, in Essex, he became in 1839 Lady Margaret professor of Divinity at Cambridge. In 1854 he declined the bishopric of Salisbury. His best-known work is *Undesigned Coincidences* (1833). See Selwyn's memoir prefixed to *Two Introductory Lectures* (1856).

Blunt, WILFRID SCAWEN (1840-1922), traveller and poet, was born at Petworth. His mother being a Catholic convert, he was educated at Stoneyhurst and St Mary's, Oscott. He served for some years as attaché to various British embassies in Europe and South America; married in 1869 Anne, daughter of the Earl of Lovelace, and granddaughter of Lord Byron (afterwards Baroness Wentworth); and travelled through Spain, Algeria, Egypt, and the Syrian desert, as recorded in his wife's *Bedouins of the Euphrates*. In 1882 he championed the cause of Arabi Pasha in Egypt. The same sympathy with national aspirations afterwards plunged him into the Nationalist cause in Ireland, and led to his being imprisoned for two months in 1887-88 for taking part in a prohibited meeting in County Galway. Blunt was the author of several volumes of verse, *Sonnets and Songs*, the *Love Sonnets of Proteus* (containing poetry of really striking merit), *Ether, Love Lyrics, The Wind and the Whirlwind* (on Egyptian affairs), *In Vinculis, Satan Absolved* (1899), &c. His complete *Poetical Works* were published in 1914, his very outspoken *Diaries* in 1919-20. He was a breeder of Arab horses.

Bluntschli, JOHANN KASPAR, jurist, was born 7th March 1808, at Zurich, where in 1833 he became professor in the new university. In politics he at first inclined to reform, but after 1839 was Conservative leader. He was a councillor of state, and became a member of the government and of the federal directory, and afterwards worked for the formation of a moderate Liberal-Conservative party in Switzerland. In 1848 he went to Munich as professor of Civil and International Law. There he published his *Allgemeines Staatsrecht* (5th ed. 1876), on which his reputation as a jurisconsult chiefly rests; *Deutsches Privatrecht* (3d ed. 1864); and, in conjunction with Arndts and Pözl, *Kritische Ueberschau der Deutschen Gesetzgebung und Rechtswissenschaft* (6 vols. 1853-58). In 1861 he removed to Heidelberg University, and became a privy-councillor of Baden, actively forwarding all liberal measures in the state. Liberty in ecclesiastical matters he had equally at heart; he acted several times as president of the *Protestantenverein*, and it was after delivering a closing speech at the general synod of Baden that he died suddenly at Karlsruhe, 21st October 1881. He is the author of valuable histories of Zurich and of the Swiss Confederation, and of a number of works on law, being especially an authority in international law. In 1884 his autobiography appeared in three volumes.

Blushing is a sudden reddening of the skin, induced by various mental states, particularly those involving shame or humiliation, shyness or modesty. It usually affects only the face and neck; rarely among civilised peoples the breast and other parts of the body. But 'the men of certain races, who habitually go nearly naked, often blush over their arms and chests, and even down to their waists' (Darwin). It is often accompanied by expressive movements; the face is turned aside, the eyes cast down or restlessly moved. It causes increased heat of the parts affected, with a sensation of heat and tingling, and often a general feeling of discomfort. It does not occur in young children.

Blushing is an excellent illustration of the control exercised over the circulation of the blood by the nervous system. Under ordinary circumstances, the muscular coat of the small arteries throughout

the body is constantly maintained in a state of partial contraction by means of the nerves distributed to it (*vasomotor* nerves; see NERVOUS SYSTEM). The blood propelled into them by the heart is thus prevented from distending them to their full extent, and its passage to the capillaries in connection with them is controlled. When, however, from any cause the action of these nerves is suspended, the arteries under their influence at once dilate, the corresponding capillaries become fuller, and the tissues containing them appear much redder than in their ordinary condition.

Under the influence of shyness, shame, &c. an alteration takes place in the nervous influence proceeding from the brain, which, for the time, lessens or stops the action of the nerves controlling the arteries of the skin of the face and neck, and blushing is the consequence. Why it should result from these and not from other mental states, and why the effect should be confined in general to the face and neck, are much more intricate questions, which cannot be discussed here. For one answer to them, with many interesting facts on the subject, see Darwin, *Expression of the Emotions*, chap. xiii.

Boa, a term popularly applied to the large snakes of the Python and Boa Constrictor families. The former are Old-World, the latter New-World giants, and closely resemble one another both in structure and habit. Both are very large, not poisonous, with great powers of crushing, with an expansible gape, with prehensile tails, with rudimentary traces of the hind-legs beside the anus, and so on. Apart from general difference of habit, the two families may be distinguished by the facts that in the pythons the premaxillæ (most anterior upper jaw-bones) bear teeth, but not in the boas; that the inferior shields of the tail are in two rows in the former, in one in the latter. Leaving the python family meanwhile, we may resume the characters of Boiæ in the strict sense.



Head of Boa.

The body of these large non-venomous crushing snakes is slightly compressed sideways, and is covered with smooth or keeled scales. The gape, tail, and hind-legs are referred to above. The genus *Boa* itself has smooth scales, a scaly head, lateral nostrils, and characteristic arrangement of shields. The common species (*Boa constrictor*), found in the north and east of South America, is usually about 12, but, according to report, may be over 20 feet in length. The colour of the back is reddish gray, with zigzag, broad, dark longitudinal stripes, including oval grayish-yellow spots; the head exhibits three dark stripes. It frequents dry bushy regions, is shy of man, and

little feared. To a large extent arboreal in its habits, it is aided in climbing by the rudimentary claw-like hind-limbs. From its concealment the boa swoops down on even comparatively large mammals, crushes them in its coils, and swallows them slowly. The bones are broken by the external crushing, a copious flow of saliva within the mouth makes the laborious swallowing of the large mass somewhat easier, but it is at the best a tedious and exhausting process. After a meal comes a period of digestion and quiescence, and in this state of torpid lethargy they may be readily killed. On waking up they are very hungry, and the demands of appetite at this time prompted a boa in the Zoo to swallow its rug, which, after a week or two of unsuccessful digestion, it put up again. Like other Boiæ, the boa is oviparous, but a case of viviparity in captivity has been recorded. Its skin is used for making boots, saddle-covers, &c. The great water-snake Anaconda (*Eunectes murinus*), the Xiphosoma of the Amazon district, the Enygrus of Java, Amboyna, and New Guinea, with keeled scales, are closely allied genera of Boiæ. See ANACONDA, PYTHON, SNAKES.

Boabdil (properly Abu-Abdallah, and nicknamed Ez-Zogoby, 'the unlucky'), the last Moorish king of Granada, dethroned his father, Abu-l-Hasan, in 1481, and two years later was defeated and taken prisoner by the Castilians near Lucena. He was set free on condition of paying tribute, and returned to Granada to struggle with his father and with his heroic uncle, Ez-Zaghal, for the throne. Thus the Moors wasted the strength they sorely needed for the final struggle with the Christians. The fall of Malaga and Baza was but the prelude to the siege of the capital itself, which was finally starved out towards the close of 1491, spite of the reckless courage of the Moors and of Boabdil, whose weak and vacillating nature fell from him in the hour of battle. The unhappy king gave up to Ferdinand the keys of the city, then turned his back on Granada, and rode on towards the mountains. At Padul, on a spur of the Alpujarras, he turned to take a last look at the towers of the fair palace and city he had lost. 'Allahu Akbar' ('God is great'), he exclaimed, as he burst into tears. His mother stood beside him. 'You may well weep like a woman,' she said, 'for what you could not defend like a man.' The spot from which Boabdil looked his last on Granada still bears the name of *el ultimo suspiro del Moro*, 'the last sigh of the Moor.' He soon crossed to Africa and flung away his life in battle.

Boadicea (also spelt *Bodicca*, *Boudicca*, and, in Fletcher's tragedy, *Bonduca*), 'the British warrior-queen,' wife of Prasutagus, king of the Icenî, a tribe in what is now Norfolk and Suffolk. On the death of her husband about 60 A.D., the Romans seized her territory, and treated the inhabitants with the most brutal cruelty. The queen herself was scourged, her daughters were outraged, and the noblest among the Icenî were treated as slaves. Boadicea, roused to fury by her wrongs, gathered round her a large army, destroyed the Roman colony of Camulodunum (Colchester), took Londinium and Verulamium (London and St Albans), and put to death, according to Tacitus, as many as 70,000 Romans. Suetonius Paulinus, the Roman governor of Britain, who had been absent in Mona (Anglesey), now advanced against the queen, and with not more than 10,000 men inflicted an overwhelming defeat on an enemy twenty times as numerous. The British loss is said to have been 80,000, the Roman only 400. Boadicea, overwhelmed with despair, killed herself by poison. Her story is best remembered by the noble poems of Cowper and Tennyson.

Boar, WILD (*Sus scrofa*), a non-ruminant, even-toed hoofed mammal, with conical teeth (Ungulata, Artiodactyla, Bunodontia). The family (Suina) to which the boar belongs, and which also includes the river-hog, the babiroussa, the wart-hog, the peccari, &c., is characterised by the pointed head with familiar pig-snout, large ears and small eyes; by the thin legs, often curled tail, bristly hide; by the four toes on fore and hind feet, of which only the two inner reach the ground; by the prominent canines, especially in the males. They are also notorious for their voracious omnivorous diet, love for damp places, and rapid multiplication.

The wild boar is a large powerful beast, measuring 4 feet or more in length, with very strong and formidable canine teeth in the male. The head is more elongated than that of the domesticated form. The strong bristles are blackish-brown, mingled with yellow, and these, along with the brownish-gray under-hair, give the animal a dark grayish-brown colour, often approaching black.



Wild Boar.

The young ones are yellowish for six months, and have white and brown stripes or spots. The adult males usually live alone, but the female is accompanied by her family, and sometimes by other sows and families. Four to six young are born in a litter. The boars come from their places of concealment at night; they devour all sorts of things, but especially vegetable produce. The sense of smell is acute, and they do not miss much of what they rout up. By their voracity and ruthless grubbing they do great damage to crops and to young trees. On account of this, as well as for the sake of their flesh and Bristles (q.v.), they are much hunted in the regions where they occur, and the fury of the enraged male, and the zeal of the sow in protecting its young, add a spice of danger to the chase. In some parts of India 'pig-sticking' is the chief sport. Many species of *Sus* have been distinguished, but four or five alone are certain: *S. vittatus*, 'from Sardinia to New Guinea, from Japan to Damaraland (South-west Africa)'; *S. verrucosus*, from Java and Celebes; *S. barbatus*, from Borneo; and *S. scrofa*, formerly common throughout temperate Europe and Asia. At Chartley, in Staffordshire, the wild boar was not extinct so late as 1683; and at Sydnop, in Derbyshire, Alpine boars and sows, introduced from the Continent, bred between 1823 and 1837, when the last was shot. The wild boar is still common in woody damp regions in some parts of the Continent.

Fossil species occur in the Miocene and Pliocene strata. *Hyotherium* is abundant in the upper Eocene and Miocene ages. The oldest representatives are *Eohyus* and *Achenodon* (*Parahyus*?) from the lower and middle Eocene, the former

'with at least four functional toes, and with certain peculiar carnivore modifications of the skull.'

A boar's head, served up as the most important dish on the baronial table, was the subject of many a carol and poetical allusion connected with Christmas festivities in England. The boar's head (see HERALDRY) is a well-known cognisance. For the wild boar's tooth, see also BABIROUSSA; for swine in domestication, see FIG.

In hunting the boar, any and every large and powerful kind of dog has been used, those with rough coats being preferred, as being less liable to severe injury from the boar's tusks. But the name BOARHOUND is generally given in England to the breed also known as Great Dane, Ulmer Dog, Deutscher Dogge or German Mastiff. It is a strong, handsome dog, which may reach thirty-three inches in height at the shoulder, carrying the head and neck high, with prick ears. It unites the strength of the mastiff with the elegance of the greyhound. It hunts chiefly by sight, but is usually a kindly, companionable dog, and is in Britain rarely employed in the chase. The hair is short, hard, and dense, the colour various shades of gray ('blue'), red, black, or white, with patches of the other colours.

Boarding is the name for an attack by one vessel on another, a company of armed men from the one forcing their way on board the other. In the days of ironclads, boarding of war vessels is less frequent than of old. See TACTICS (NAVAL). A *boarding-net* is a framework of stout roping placed so as to obstruct boarders.

Boarding-out System. See POOR.

Boardman, GEORGE DANA, Burmese missionary, was born in the State of Maine in 1801, and educated at Andover. Ordained in the Baptist Church in 1825, he sailed the same year to the East Indies, and after mastering Burmese, began his labours at Maulmain in May 1827. He had great success, especially in his preaching tours; but the severe strain soon broke down his health, and brought on his death early in 1831. His widow married the more famous Burmese missionary, Judson.

Board of Trade. See TRADE. For other boards, see WORKS (BOARD OF), EDUCATION, POOR, &c.

Boar-fish (*Capros*), a genus of fishes in the



Boar-fish (*Capros aper*).

Carangidæ or Horse-mackerel family of Acanthopterygii or bony fishes with spinous rays. The protrusible mouth presents a resemblance to a hog's snout as the name suggests. The body has an oval compressed form like that of the related John Dory, from which it differs conspicuously in the absence of spines at the base of dorsal and anal fins, and of long filaments on the dorsal spines. The common Boar-fish (*C. aper*) is a well-known

inhabitant of the Mediterranean, rarely caught on the coasts of England. The eyes are very large, and placed far forward; the body is of a carmine colour, lighter below, and with seven transverse orange bands on the back.

Boarhound. See BOAR.

Boat is the name applied to a small open vessel, used for conveyance on water. Boats differ very considerably at various parts of the coast, and in the different countries of the world, being usually adapted to the nature of the waters and the conditions of the service in which they are employed. They may be lightly or strongly built; flat-bottomed or round; bulky in form for carrying, or long and small-bodied for speed; of little draught where the water is shallow, or of great draught for deep water. Boats are built plainly for commercial purposes, and are highly finished, even ornamental, for pleasure. They are usually propelled by oars or sails, but, since the beginning of this century, motors are gradually displacing manual power.

The earliest boats were very primitive. First, there was a rude *raft*, formed by binding tree-trunks together; then the *dug-out*, made from a tree-log hollowed out and roughly shaped at both ends. These were used in various countries, including our own, and some ancient specimens are still preserved. Both types are still not unknown, and from these the modern boats—flat-bottomed, and round—have gradually been developed. At an early date there was the rudimentary structure, built with wooden laths, covered with skins or canvas, and smeared over with pitch to make the boat watertight. Such was the small *coracle* of the ancient Britons, which could be carried by a man on his back. Or the covering might be the bark of trees sewn together and made watertight with gums, like the Indian *canoe* of North America. Similar types of boats appear to have been produced in countries far apart and between which there was apparently no communication. The only reason to account for this would seem to be that similar wants and conditions had to be contended with, and there was a similar lack of materials and appliances to produce anything better.

Coming to modern times, there are many cases of similarity in types produced in various parts of the world. The *canvas boats* used by the Galway fishermen are long and narrow. Though as much as 20 feet in length, one of these boats can be carried by one man. They have a crew of four men, each man using a pair of short oars. They have many of the characteristics of the *surf-boat*. Then the flat-bottomed *sharpie* (fig. 1) of

warship, and is longer and more nearly flat-bottomed than the longboat was.

Typical boats used in the navy are as follows: *Steam-launch*.—42 feet in length, by 11 feet 6 inches beam, and 4 feet 6 inches depth; carvel built, of double skin teak laid diagonally. *Steam-pinnace*.—36 feet in length, by 10 feet 3 inches beam, and 3 feet 6 inches depth; carvel built similarly to the launch. *Steam-cutter*.—Varying greatly in size, but a lighter boat than a pinnace; carvel built in similar fashion. One of 30 feet length would be 8 feet beam, and 2 feet 8 inches depth.

On battleships, steam-launches burning coal are still preferred, because they are less likely to be set on fire than motor-boats with petrol or paraffin fuel. But on light-cruisers, destroyers, and other small craft, *motor-launches* are used. The motors usually run on paraffin fuel, but start on petrol.

Typical navy boats used for rowing are as follows: *Gig*.—A long, narrow, light boat, with six or eight oars; 30 feet in length, with a beam of 5 feet 6 inches, and 2 feet 2 inches depth; clencher built, of elm. *Whaler*.—A sharp-sterned boat, with good sheer, having six oars, also sails; 27 feet in length, by 5 feet 6 inches beam, and 2 feet 2 inches depth; clencher built, of elm. *Dinghy*.—The smallest boat, from 12 to 14 feet in length, 4 feet 8 inches beam, and 2 feet 2 inches depth; can be rowed by one man; clencher built, of elm. For destroyers, a *light whaler* is built, clencher fashion, of yellow pine, 25 feet in length, 5 feet 6 inches beam, and 2 feet depth, and has four oars. A *light dinghy* is also built, clencher, of yellow pine, 16 feet long, 4 feet 6 inches beam, and 1 foot 10 inches depth. *Canvas Berthon boats*, which are collapsible, are also supplied for destroyers. All these boats, except the whalers and the Berthon boats, have transom sterns.

The boats around our own shores are infinite in variety, but only a few typical ones can be mentioned here. On the Thames there is the waterman's skiff or wherry (fig. 2). This is a lightly



Fig. 2.—Thames Wherry.

built boat, as the water is sheltered and smooth. At many places somewhat similar boats are used, but of stronger build and modified proportions where there is exposed water, and beaching necessary. At almost every place on the coast a square-sterned boat of this sort is much in use, about 14 feet in length, with three thwarts, and the seats in the stern. At Portsmouth the waterman's boat is sharp-sterned like a whale-boat, and is admirably adapted for broken water, the sea there being very short and steep, with an east wind on an ebb tide. These boats are larger—up to 25 feet in length—and also carry a mainsail, mizzen, and jib. The

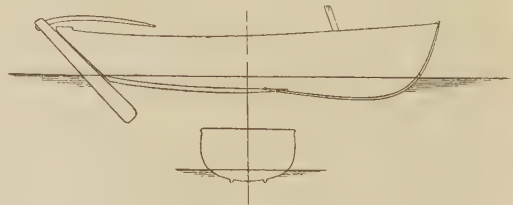


Fig. 3.—Coble.

Connecticut is of somewhat similar type to the Chinese *sampan* and the Wexford *cot*. Again, the *sneak-boat* of New Jersey, which has a spoon-shaped bow, bears a resemblance in many ways to the old *Irish canoe* of Kilkee and the Norwegian *gram*.

Before the days of steam power, the largest and strongest boat carried on board a ship was the longboat. And, for a long time, the royal navy set the pattern for the boats in the merchant service, and on the coast these were copied. But the introduction of steam brought about the extinction of the largest boats propelled by oars. The steam-launch then became the largest boat carried by a

fishing-skiff on the west coast of Scotland is also a sharp-sterned boat, for similar reasons, but is

rigged differently, having a lugsail and jib. On the north-east coast of England a peculiar, long, flattish-bottomed boat is in use by the fishermen, called a 'coble' (fig. 3). The particular form is adopted because this boat is beached stern first in surf, and the high, sharp, flaring bow is designed to meet the dangerous seas on that coast. The draught aft is very shallow; and as these boats are sailed, the peculiarly deep rudder and the fore-foot check the tendency to make leeway. This type of boat is reported to be excellent in bad weather, and is built from 15 feet to 40 feet in length. By way of contrast, in some parts of the western isles of Scotland, such as Barra, the boats in favour are almost V-shaped in cross section; so also are the very primitive boats of Fair Isle, between Orkney and Shetland.

On inland waters there are some very light boats used for pleasure. The punt on the upper Thames is a long, flat-bottomed boat, propelled by a pole. Then there is the Thames skiff or randan (fig. 4),



Fig. 4.—Randan.

a very popular rowing-boat, usually built of cedar or mahogany, from 20 to 40 feet in length. These boats are very finely finished. On inland lakes, such as Windermere, a somewhat similar type of boat is found.

Every merchant vessel is required by law to carry a sufficient number of boats to accommodate all

In large yachts there may be one or two launches, but a steam-launch is now seldom seen. They are generally driven by petrol motors, these being much handier than paraffin motors, and, the boats being open, there is little danger, if proper precautions are taken. The most important boat on a large yacht is the lifeboat. This boat is similar to those in the merchant service, though there are often modified arrangements. A very useful yacht's boat is the cutter, lighter than the lifeboat, and without flotation cases. This boat is used by the crew for the general work of the ship. The dinghy is the smallest boat carried, being from 8 to 16 feet in length. Yachts' boats are not under Board of Trade jurisdiction.

Motor-boats.—The introduction of the marine motor early in this century has gradually revolutionised the small boat. The motor is taking the place of manual power in almost every class. A portable motor can even be attached to a small dinghy or other very light boat. Whether it be a shore boat for pleasure, a harbour boat, a fishing boat, or a ship's boat, the motor is found on board, and it seems likely that very soon the great majority of boats will be motor

driven. The petrol motor is most generally used, but paraffin fuel motors are adopted in certain classes of boats.

For Racing-boats, see ROWING.

Boat-building.—The design is prepared on paper, and then transferred to the floor of what is termed a 'mould loft,' and made full size. From this full-



Fig. 5.—Lifeboat.

persons on board. These vary considerably in type. Pontoon lifeboats have collapsible bulwarks, and may be stowed one above another; there are also rafts; but the most serviceable lifeboat is the 'open' type (fig. 5). This boat, in large vessels, is usually 28 feet in length, and has flotation cases



Fig. 6.—Four-oared Racing-boat.

all along under the side seats, so that she may float, with all on board, even if filled with water. The lifeboat is a rowing-boat, carrying also sails—usually a lugsail and jib. The construction and equipment of boats for the merchant service must comply with the Board of Trade regulations. Large passenger vessels are now carrying motor-boats, though not compelled to do so. The Board of Trade, however, insist that the motor runs on paraffin fuel, though it may be arranged to start on petrol. These motor-boats are not intended to take the place of lifeboats, but are meant to tow a number of lifeboats in case of disaster to the vessel. Wireless apparatus is sometimes carried by these motor-boats.

Yachts' boats are generally similar to those on merchant vessels, but are very highly finished and much lighter in construction. A gig is never used now, the owner's launch having taken its place.

size drawing, wood moulds of the cross sections are made, as shown by fig. 7, with a notch to fit over the keel. The stem, stern-post, and keel are cut out to the required shape, and scarphed and fastened together. This part of the structure is then fixed on building-stocks, consisting of blocks of wood, or a 'deal' secured edgewise in a horizontal position on uprights. The stem and stern-post are further temporarily connected at their upper ends by a fore-and-aft batten of wood, and they are also held in position on the stocks by struts extending to the floor and to the beams in the roof of the building-shop. The stern-board or transom, and the moulds of the cross sections, are then fitted and secured in their proper places. The moulds are further secured by bands of wood called 'ribbands,' temporarily bent round on the outside. The moulds and the stem and stern-post are marked (see *b, b, b*, fig. 7) to represent the widths of the planks, which are about 5 inches, including $\frac{3}{4}$ inch overlap in 'clencher-built' boats termed the landing (fig. 10).

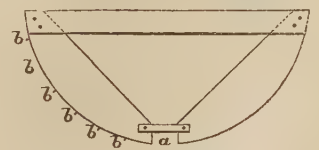


Fig. 7.—Mould.

The bottom plank, called the garboard strake, is first fitted truly into a rabbet, or groove, cut in the keel, stem, and stern-post to receive it, and it is nailed at intervals of about 3 inches. The next plank is then held over the upper edge of the garboard strake, and marked round with a pencil. This plank is removed and sawn through along the pencil line, the overlap being allowed for. The upper edge of this plank is then cut to the right width to fit the marks, *b, b*, on the moulds, stem and stern-post, and it is planed and the edges bevelled to fit round the curve of the moulds. The plank is held in position by a series of wooden clamps, set up by wedges, as shown in fig. 8. The edges of the plank are



Fig. 8.—Clamps.

then fastened together at intervals of about 3 inches, the nails being put in from the outside, and clenched on the inside on rooves (small copper rings). When all the planks are on and fastened together, the timbers, or ribs, are put in, about 6 inches apart. These are usually made of American elm on account of its straight grain, flexibility, and toughness. The ribs, having been cut to the required size, are put into a long box supplied with steam from a boiler, and are kept there until they are sufficiently pliable to be easily bent round the bilges of the boat inside without injuring them—in one piece, passing over the top of the keel. The planking is now nailed to each timber, the nails being put in from the outside through the landings, and clenched on rooves on the inside of the timbers. The timbers are also fastened to the keel. After all the timbers have been fitted and nailed, the 'inwales,' or gunwales, are fitted over their heads, and nailed and rooved to the gunwale strake, and connected at the forward end by a breast hook, and to the transom by knees at the aft end. A bearer or stringer is fitted round the boat inside, to take the seats or thwarts, the latter being further secured to the sides of the boat by knees extending to the gunwales.

Fig. 9 shows in detail the construction of a clencher-built boat. Oak-knees, termed floors, are

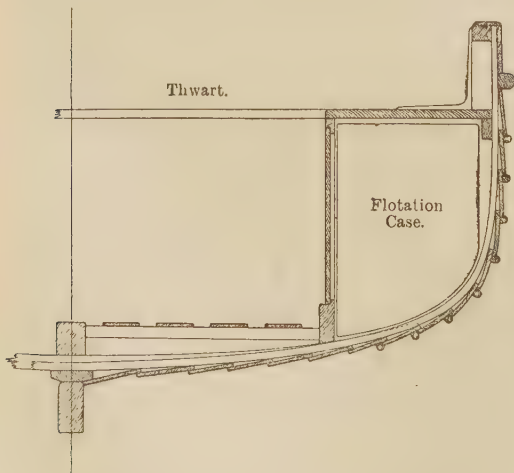


Fig. 9.—Construction of Lifeboat.

fitted alongside the timbers, and these are particularly necessary when the bottom of the boat is so sharp that the timbers cannot be bent round over the keel. In a carvel-built boat the surface is smooth, the edges of the plank meeting, as shown

by fig. 11. The seams are generally caulked with oakum or cotton, and payed with marine glue or putty. But in boats where carvel planking is thinner, close or 'tub' jointed seams are adopted

Fig. 10.
Clencher.Fig. 11.
Carvel.Fig. 12.
Tub-jointed
Carvel.Fig. 13.
Ribband
Carvel.

(fig. 12). Light racing-boats and canoes are carvel-built, but the plank is too thin to admit of caulking, or of tub-jointing, and a strip of wood is worked over the seams inside. The construction is then termed 'ribband' carvel (fig. 13). Another system of carvel planking is the 'double diagonal.' This gives great strength and lightness for boats such as launches and lifeboats. The two thicknesses of planking are wrought across each other at right angles, and are fastened together (with calico between) as well as to the framing.

Boat-lowering and Disengaging Gear is the system of ropes, blocks, and davits or cranes, by which ships' small boats are lowered to the sea, and sent clear of the fastenings. In the early history of shipping, no proper means were employed for launching boats; but as the passenger-carrying trade developed, vessels were built having davits with blocks and falls, or tackle. The first davits were fixed wooden uprights at the sides of the ship; then hinged wooden uprights called 'topping davits;' then curved iron, fitted in sockets, but capable of turning round. The last-named method is still the one most often adopted; but iron davits, hinging in a somewhat similar manner to the old wooden topping davits, have been fitted within recent years.

Until comparatively recent times, the almost universal mode of attaching boats to the falls and blocks was by an eye on the bottom of each lower block, which engaged with a hook fixed near the bow and stern of the boat. Many calamities befalling boats when being launched in the hurry and excitement of shipwreck or other emergency at sea have led to the adoption of means for quickly disengaging them from the lowering tackle, and for regulating the process of lowering as well. The first recorded invention of an improvement for lowering and disengaging boats was in 1830; and since that time there has been a plentiful list of devices. But although many apparatus have been designed to accomplish the safe lowering of boats, the commonest practice, as stated, is to employ the plan of simple block and falls.

Some recent methods for disengaging ensure that a boat suspended from the falls cannot be unhooked or released until entirely water-borne, and all strains taken off the falls.

Fig. 14 shows one type of disengaging hook in position, with the boat suspended. Fig. 15 shows

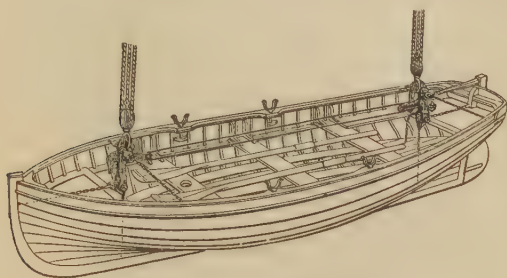


Fig. 14.—Boat Suspended.

an enlarged view of another type of hook, with the boat suspended. When the fore-and-aft line, reaching from tumbler and holding them up, is allowed to slack, the tumblers drop and allow the hooks to swing back on their pivot (see fig. 16),

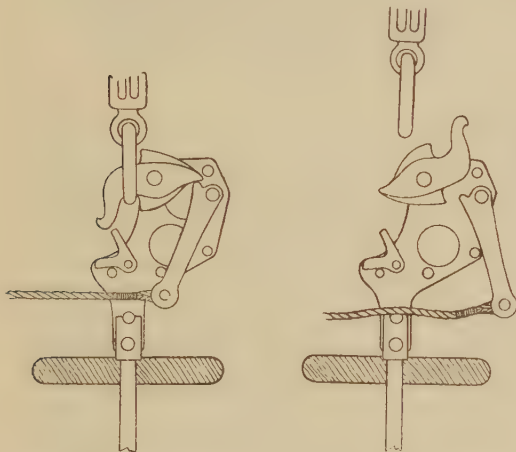


Fig. 15.—Hook Engaged.

Fig. 16.—Hook Released.

thus freeing the blocks and tackles. The fore-and-aft line is under control of the coxswain, and by keeping the line hand-taut while the boat is being lowered, there is no possibility of the boat disengaging itself should one end of it touch the water before the other. Even when the boat is completely water-borne, the hooks of themselves cannot become disengaged, unless as the result of a slackening of the line.

Boat-plug is a wood, cork, or metal stopper, fitted in a socket through the bottom of a boat, to drain away the water which may have been shipped or have leaked in while the boat was in use, or rain-water. The Board of Trade require that each boat shall have two plugs—one a spare one—both to be attached to a fixed part of the bottom by lanyard or chain.

Boatbill (*Cancroma cochlearia*), a bird of the Heron (q.v.) family, the only known species of a genus differing from the true herons in little else than the form of the brown bill, which is comparatively short and very broad, the mandibles resembling the bowls of two spoons placed one upon the other, the upper mandible overlapping the lower, keeled on its upper ridge, and hooked at the point. The boatbill is about the size of a domestic fowl, has shorter limbs than most of the herons, but resembles them in plumage, and is abundantly provided on the back of the head and neck with

elongated feathers, which it erects when irritated. The front parts are white (the crown black in the male), the upper surface and tail whitish gray, the



Boatbill (*Cancroma cochlearia*).

under side yellowish white, the belly rusty red. It inhabits Cayenne, Surinam, Brazil, &c., sits perched upon trees which hang over streams, and darts down upon fish, which seem to be its principal food.

Boat-fly (*Notonecta*), a genus of insects of the order Hemiptera (q.v.), sub-order Heteroptera, and family Hydrocores, or Water-bugs (q.v.). The English name well describes their boat-like form, eminently adapted for progression in water. They have the peculiar habit of always swimming on their back, and of resting in this posture suspended at the surface of the water. Their hindmost legs are very long, and when these are thrown out at rest the insect looks like 'a waterman resting on his sculls.' One species, *N. glauca* (sometimes called the *Water Boatman*), is common



Water Boatman (*Notonecta glauca*).

in Britain and throughout Europe; it is about half an inch long, and varies considerably in colour; but exhibits a general greenish tinge, the other colours being black, brown, and gray. They fly well, but seldom use their wings. They move with difficulty on dry ground, and prefer to keep to quiet water. When they descend into the water, they carry down a supply of air in a hollow between their folded wings. They feed voraciously on animal substances, often kill and devour those of their own species, and are said to do damage among fish-spawn. There are many species, but only two are European. An allied genus (*Corixa*) swims in the normal fashion, and is represented in almost every quiet pool.

Boat-lowering and Disengaging Gear. See BOAT.

Boatman. See BOAT-FLY.

Boat-racing. See ROWING.

Boatswain, the officer on board ship who is responsible for the efficiency of the boats, sails,

rigging, cables, anchors, flags, cordage, and generally stores in connection with these. In the navy he is a warrant-officer, and is immediately under the navigating officer in some of these duties. He also keeps account of all the spare rigging, &c., and superintends the replacement of old by new. He assists in the necessary business of the ship. There are signal boatswains, torpedo boatswains, and boatswains for quarter-deck duties. Boatswains' mates are petty officers or leading seamen who assist the boatswain, and 'pipe' orders with a boatswain's whistle or 'call.'

Boavista, the easternmost island of the Cape Verde group. Very arid, it produces salt and orchil. Area 240 sq. m.; pop. 3000.

Bobadilla, FRANCISCO, the Spanish commander appointed to supersede Columbus as viceroy of the Indies, who sent Columbus home in chains. Having utterly mismanaged matters, he was recalled from Hispaniola under arrest, and drowned on the way to Spain (1502).—The use of 'Bobadil' as a braggadocio comes from the blustering captain in Ben Jonson's *Every Man in his Humour* (1598).

Bobak, or **BOBAC** (*Arctomys bobac*), a species of Marmot (q.v.) ranging (now or lately) from Poland to eastern Siberia.

Bobbin, TIM. See COLLIER (JOHN).

Bobbin-net. See LACE.

Bobbins are small wooden reels or rollers, flanged at the ends, and bored through the centre lengthwise, so that they can be placed on a spindle or skewer. The bobbin or pirn on which ordinary sewing-thread is wound, although generally of small size, is a good example of their prevailing shape. Bobbins are used in the spinning processes for cotton, flax, wool, and silk, and are of various sizes, the largest being generally those used for the slubbing frames where the cotton, for example, first passes from the lap shape given by the carder into a loose kind of strand. After this the bobbins diminish in size for the various succeeding stages to the finished yarn. A 'slubbing' bobbin may be 15 inches long and 5 inches in diameter at the flange, but one or two exceptional kinds are larger than this. For special purposes, such as lace-making, the bobbins used are quite unlike the ordinary kinds. These and some other varieties are made of metal. Paper tubes are now largely adopted in certain cases where bobbins were formerly employed. Bobbins are made of birch, beech, ash, and plane tree, and machinery for their manufacture has been erected here and there in the Highlands of Scotland and other wooded parts of the country. But they are also largely made of American and other foreign woods, as well as from native material, in factories in Lancashire and Yorkshire. Ingenious automatic machinery is now employed, especially for making the smaller sizes. It will be readily understood that bobbins are used in enormous numbers wherever there are large spinning-mills.

Bobbio, a Lombard town, 3 miles SSE. of Pavia, near the confluence of the Bobbio and the Trebbia. Bobbio originated from a monastery founded here in 612 by St Columbanus (q.v.), whose famous library has mostly found its way to the Vatican. Since 1014 it has been the seat of a bishopric. Pop. 5000.

Bob-o-link, or **BOBLINK**, **REED BIRD**, or **RICE BIRD** (*Dolichonyx oryzivorus* or *Icterus aciripennis*), a common American bird found from Paraguay to Canada, the only one of its kind, and that difficult to classify. Some place it near the Baltimore bird (*Icterus*), others near starlings, but both the characteristics and the character of the bob-o-link exhibit much that is unique. The beak is short

and straight; the nostrils surrounded by a fold of skin; the wings are long, especially in their first feather; the tail-feathers are stiff-pointed. The



Bob-o-link.

plumage is unusually conspicuous for a ground bird. In the male the head, lower surface, and tail are black, while the upper surface is lighter, yellowish white in front, black with yellow streaks behind. The colour and the note change with the seasons, and with the functions of the bird. The female is much plainer—yellowish brown with darker streaks above, and pale grayish yellow below.

The name—originally *Bob Lincoln*—is an imitation of the bird's note. In song, the full-throated male bob-o-link is unique, rivalling the lark, imitable by the mocking-bird, 'in qualities of hilarity and musical tinnabulation,' according to Burroughs (*Birds and Poets*), quite unequalled. His volubility borders on the burlesque. In disposition also the male is interesting; he affords the 'most marked example of exuberant pride, and a glad, rollicking, holiday spirit, that can be seen among American birds.' His love-making emotions appear to be unusually strong, as strong indeed as his Quaker mate is shy, retiring, and indifferent. The change of the male in colour and form at the breeding time is very striking. He becomes black and white more emphatically, so as sometimes to be called the 'skunk bird,' and acquires a broad form and a curious 'mincing gait.' Robert o' Lincoln becomes 'an ornithological coxcomb' of the highest order. He sings on brier and weed, or jerking up and down in the air, while his mate may be brooding in a simple nest among the grass. The bob-o-link is said to exhibit the common trick of seeking by exaggerated fuss in some other quarter to lead intruders away from the nest.

The bob-o-link is a bird of passage, spending the winter in the West Indies. In summer it is found as far north as the banks of the Saskatchewan, in 54° lat., but is most plentiful in the Atlantic states and other eastern parts of America, where it is to be seen in every meadow and cornfield. It renders good service by the destruction of insects and their larvæ; but in the South, both in April and August, at seed-time and harvest, its ravages seriously cripple the rice-growing industry, and destroy about a fourth of the crop. Thousands of men and boys are then employed to shoot the trespassers, who are killed in great numbers for the table; their flesh is delicate, and resembles that of

the ortolan. On account also of their beauty and powers of song, many are caught, caged, and sold in the New York and other markets.

Bobruisk, a town of White Russia, on the Beresina, 87 miles SE. of Minsk by rail, with a large trade in wood and corn. It was besieged ineffectually by the French in 1812, and was made a fortress of the first rank by the Emperor Nicholas. Pop. 40,000 (very many of them Jews).

Bocage, MANOEL DU (1766-1806), a great Portuguese poet. See PORTUGAL.

Boca Tigre (also Bocca Tigris, and in English Bogue), the Portuguese translation of the Chinese name *Hu-mun*, 'tiger's mouth,' given to a portion of the estuary of the Canton River (see CANTON). On its rocky islands are situated the Bogue forts, which have been more than once captured by the British.

Boccaccio, GIOVANNI, was born either at Paris or at Florence in 1313. He was the illegitimate son of a merchant of Certaldo, and at the age of ten was apprenticed to a merchant of Paris. Disliking commerce, he attempted but quickly abandoned the study of canon law, and was then sent by his father to Naples, with the intention that he should follow a mercantile career. At Naples he gave himself to story-writing in verse and prose; mingled in courtly society; and fell in love with the lady whom, under the name of Fiammetta, he made well-nigh as famous as the Beatrice of Dante and the Laura of Petrarch. In the *Filicopo* she is said to have been an illegitimate daughter of King Robert of Sicily; in the *Fiammetta* she is represented as a beautiful Neapolitan, of noble but not of royal descent. She appears in a number of Boccaccio's works, and is one of the story-tellers in the *Decameron*. Up to the year 1350 Boccaccio lived alternately at Florence and at Naples. Between 1340 and 1350 he produced the prose tale of *Fiammetta*; the *Ameto*, a pastoral piece; and the *Amorosa Visione*, in which he sang the praise of his mistress in *terza rima*. To the same period belong the *Filicopo*, the *Teseide*, and the *Filostrato*. In the *Filicopo* the story of *Flora et Blanchefleur*, one of the finest of the French 'Romans d'Aventures,' is cast into prose and embroidered with fanciful rhetoric, but is hardly improved in the retelling. The *Teseide* is a graceful version in *ottava rima* of the mediæval romance of Palamon and Arcite, the same story as forms the subject of Chaucer's *Knight's Tale* (a poem which is to a great extent translated from Boccaccio's), and of Shakespeare and Fletcher's *Two Noble Kinsmen*. The *Filostrato*, which is likewise in *ottava rima*, deals with the loves of Troilus and Cressida, a story which had become widely popular in various forms after the appearance in 1287 of Guido of Messina's Latin romance of Troilus and Briseis. The heroine's name was changed by Boccaccio, from whose poem Chaucer translated nearly half of his *Troilus*. The year 1350 may be taken as the beginning of a new period in Boccaccio's life. Until then it is a life given to song and love and adventure. Thenceforth, for some fifteen years, it is the life of an honoured citizen, of a diplomatist intrusted with important public affairs, of a scholar devoted to the cause of the new learning. During this period, in which he formed a lasting friendship with Petrarch, Boccaccio, as Florentine ambassador, visited Rome, Ravenna, Avignon, and the court of the Margrave of Brandenburg. In 1358 he completed his great work, the *Decameron*, which he had begun some ten years before. In 1360 he lodged in his house the wandering Greek scholar, Leontius Pilatus, whom he persuaded the Florentines to appoint to a Greek professorship, and by whose aid he was enabled to transcribe and forward to Petrarch prose

versions of the *Iliad* and the *Odyssey*. He for some time held a chair founded for the elucidation of the works of Dante, on whose *Divina Commedia* he produced a commentary, now mainly interesting from the light which it sheds on Florentine life in the 14th century. During his last years he lived principally in retirement at Certaldo, and would have entered into holy orders, moved by repentance for the follies of his youth, had he not been dissuaded by Petrarch. He wrote in Latin an elaborate work on mythology, *De Genealogia Deorum*, and treatises *De Claris Mulieribus*, *De Montibus*, &c. He died at Certaldo on the 21st December 1375.

Boccaccio ranks among the great writers of Europe in virtue of the prose tales of the *Decameron*. This famous book opens with a description of the plague at Florence in 1348. Seven ladies and three gentlemen are introduced, who leave the city and betake themselves in quest of security and distraction to a country villa. There they while away ten days (whence the name *Decameron*) by each in turn telling stories in the garden. In all, one hundred tales are thus told. Many of these are extremely licentious; others are full of pathos and poetical fancy; several are masterpieces of imaginative creation; all are related in exquisitely graceful Italian. Boccaccio selected the plots of his stories from amid the floating popular fiction of the day, and especially from the *fabliaux* which had passed into Italy from France. His originality lies in his consummate narrative skill, and in the rich poetical sentiment which transforms his borrowed materials. The influence of his great book upon European literature has been wide and profound. Among his countrymen, by whom he has been generally accepted as an almost incomparable master of Italian prose, he has found many imitators, the most notable being Firenzuola, Bandello, Cinthio, and Grazzini. In France the transformation of the *fabliau* into the *nouvelle* was partly due to the example set by Boccaccio. His influence is apparent in such collections of tales as the *Cent Nouvelles Nouvelles* ascribed to Antoine de la Salle, the *Grand Parangon de Nouvelles Nouvelles* of Nicholas of Troyes (1535), and the *Heptameron* (1558) of Marguerite of Navarre. Several of Boccaccio's stories are versified in the *Contes de La Fontaine*, in whose hands they assume a close resemblance to the form under which, as *fabliaux*, they had crossed the Alps into Italy. The debt of English writers to Boccaccio begins with the translations in Chaucer's *Troilus*. In the *Canterbury Tales* the stories told by the Reeve and the Franklin, and the story of Patient Griselda, are founded either on stories in the *Decameron* or on the same *fabliaux* as had been recast by Boccaccio. Sidney's *Arcadia*, says Mr Symonds, 'is a copy of what Boccaccio had attempted in his classical romances.' Cyril Tourneur's *Atheist's Tragedy*, Marston's *Parasitaster*, and Fletcher's *Women Pleased*, are examples of plays of which the plots were taken, wholly or partly, from Boccaccio. The scene of the caskets in the *Merchant of Venice* corresponds to a story in the *Decameron*. The plot of *All's Well that Ends Well* is taken from Boccaccio's story of Giletta and Beltramo, and the plot of *Cymbeline* is partly drawn from the ninth novel of the second day. None of Dryden's works have had more enduring popularity than his *Tales from Boccaccio*. In later days, Keats (in *Isabella*), Tennyson (in *The Falcon* and *The Lover's Tale*), Longfellow, Swinburne, and George Eliot are among those who have turned for their subjects to the deathless pages of the hundred tales.

Apart from the narrative interest and beauty of conception which mark its finest stories, the salient feature of the *Decameron* is the contrast between

the subjects and the style. The matter is medieval, while the form is classical. Boccaccio collected much that was choicest and most typical in the popular fiction of his day, and handed it down to modern times enshrined in imperishable language. The two great tendencies which run through European literature, the classical and the romantic, are seen working together in the *Decameron* as they are hardly to be seen elsewhere. The stories retain their medieval colour and flavour; yet the style preserves the classic dignity and elegance, the classic disdain of unessential detail. Despite the delicacy of many of the novels, the impression left by the book as a whole is neither one of frivolity nor of grossness. The satiric malice and reckless levity of the *fabliaux* are replaced by a voluptuous melancholy, a refined pensive epicureanism. 'The central idea of the book,' says M. Émile Montégut, 'is that of love, represented as the chief motive force in social life, and the sovereign of the world. Love takes the place which fate held with the ancients, and which free-will holds among Christians.' The same fine critic maintains that the tales have been carefully linked in the order best suited to enforce this central conception. Whether or not they were so arranged, the frame in which they are set is a masterpiece of literary art. The impressive account of the plague at Florence—the description of the burning noon-day calm, which recalled to Ampère the opening of Plato's *Phædo*—the contrast which haunts the reader throughout the book, between death ravaging the world outside, and the quiet garden with its graceful inmates engrossed in song and story—the poetical fancy which invests Fiammetta and her companions with an undying charm—to these things there is no parallel in the works of Boccaccio's followers, as there is none to the golden perfection of his style.

See Italian lives by Baldelli and Tiraboschi; German by Landau and Koerting; English by Hutton (1909); Bartoli, *I Precursori del Boccaccio*; studies by Crescini (1887), J. A. Symonds (1894), Lee (1909).

Boccage, MARIE ANNE FIQUET DU (*née* Le Page), a French poetess, once famous, now almost forgotten, born at Rouen, 22d October 1710. She published a small volume of verse in 1746; next an imitation of Milton, *Paradis Terrestre*, in 1748; and in 1756, her most important work, *La Colombiade*. Her letters to her sister, written while travelling through England, Holland, and Italy, are her most interesting work. During her lifetime she was excessively bepraised by men so great as Voltaire and Fontenelle; but modern readers cannot help thinking that her beauty must have recommended her verses. She was elected member of many learned academies, and died 8th August 1802.

Boccherini, LUIGI, composer, born at Lucca, 14th January 1740, studied at Rome, and appeared with great success at Paris in 1768. He next went to Madrid, and became chamber-composer to the Infante Don Luis, afterwards holding the same post under Frederick-William II. of Prussia. With the king's death in 1797, however, Boccherini's salary ceased, and the remainder of his life was darkened by poverty and ill-health. He died at Madrid, 28th May 1805. He wrote three hundred and sixty-six instrumental works, mostly trios, quartets, and quintets for strings, in which the 'cello is prominent; of his vocal works, a *Stabat Mater* for three voices has been published. Melodious, dignified, and displaying great originality, his best works are still esteemed.

Bochart, SAMUEL, a learned Protestant divine, was born of a good family at Rouen in 1599. He very early exhibited a remarkable aptitude for learning languages, and after extensive studies,

especially in the Semitic languages, at Paris, Sedan, Saumur, and Leyden, was chosen pastor of the Protestant church at Caen. Here in 1629 he gained great reputation by his victory in a public discussion of nine days' duration over the famous Jesuit, Verin. In 1646 he published his *Geographia Sacra*, a work of marvellous erudition. In 1652 he went to Stockholm along with his disciple, Huet, on the invitation of Queen Christina. The court-life, however, did not suit him, and his visit was short. His great work, *Hierozoicon, sive de Animalibus Scripturæ Sacræ*, published in 1663, had afterwards the honour of being commended by Cuvier. He died suddenly, May 16, 1667. A complete edition of his numerous works was published at Leyden in 1712; and a new edition of the *Hierozoicon* at Leipzig, in 3 vols. (1793-99).

Bochnia, a town of Polish Galicia, 24 miles ESE. of Cracow by rail. Extensive mines of rock-salt employ upwards of 500 miners. Pop. 10,000, a fourth of them Jews.

Bocholt, a town of Prussia, on the Aa, 13 miles N. of Wesel by rail, with manufactures of chicory, cotton goods, iron wares, and machinery; pop. 25,000.

Bochum, a town of Prussia, 35 miles NE. of Düsseldorf by rail, a great centre of Westphalian industry. Steel ropes and cables, machinery, files, tubing, safety-lamps, coal-tar substances, tin, roofing-felt, bricks, oil, and carpets are among its manufactures. There are great coal-mines near. Pop. 143,000.

Bock, HIERONYMUS. See TRAGUS, BOTANY.

Böcklin, ARNOLD (1827-1901), a painter mainly of mythological subjects, was born at Basel, studied and worked in Germany and Italy, and settled finally near Zürich.

Bócland (i.e. book-land, or rather charter-land or deed-land), one of the early Anglo-Saxon forms of land tenure. Being proved by writing, it was distinguished from the Ethel, which had also been severed by an act of government from the Folcland (q.v.), and converted into an estate of perpetual inheritance, but which was proved by the pedigree of the owner and the witness of the community. It might belong to the church, to the king, or to a subject; it might be alienable and divisible at the will of the proprietor; it might be limited in its descent, without any power of alienation in the possessor. It was often granted for a single life or for more lives than one, with remainder in perpetuity to the church. It was forfeited for various delinquencies to the state, was exempt from service, except the *fyrd*, repair of bridges, and maintenance of fortifications.

Bode, JOHANN ELERT, astronomer, was born at Hamburg, 19th January 1747; in 1772 he became astronomer of the academy in Berlin, and in 1786 director of the observatory there. He published numerous astronomical works, including *Sternkunde* (3d ed. 1808), and *Uranographia* (2d ed. 1818), and founded the *Astronomische Jahrbücher*. He died 23d November 1826. The arithmetical relation subsisting between the distances of the planets from the sun, called after him Bode's Law, may be thus stated: Write, in the first instance, a row of fours, and under these place a geometrical series beginning with 3, and increasing by the ratio 2, putting the 3 under the second 4; and by addition we have the series 4, 7, 10, &c., which gives nearly the relative distances of the planets from the sun.

4	4	4	4	4	4	4	4	4
	3	6	12	24	48	96	192	384
4	7	10	16	28	52	100	196	388

Thus, if 10 be taken as the distance of the earth from the sun, 4 will give that of Mercury, 7 that of Venus, and so forth. The actual relative distances are as follow, making 10 the distance of the earth:

Mercury. Venus. Earth. Mars. Asteroids. Jupiter. Saturn. Uranus. Neptune.
3.9 7.2 10 15.2 27.4 52.9 95.4 192 300

Close as is the approximate correspondence between the law and the actual distances, no physical reason has been given to account for it, although there is little room for doubt that such exists. Bode's law is therefore, in the present state of science, empirical. Kepler was the first to perceive the law, and Bode argued from it that a planet might be found between Mars and Jupiter, to fill up the gap that existed at the time in the series. The discovery of the Planetoids (see PLANETS) has proved the correctness of this prediction.

Bode, THE BARON DE, a baron of the Holy Roman Empire and not a British subject, though born in England of an English mother, claimed a share in the payment made by France in 1814 to indemnify British residents who had suffered by confiscation during the Revolution. The English government repudiated his claim in 1852. See Childe-Pemberton, *The Baroness de Bode* (1900).

Bode, WILHELM, art critic, and from 1889 director of the gallery at Berlin, was born in 1845, the son of a Brunswick member of the German Reichstag, and has written largely on Rembrandt and Dutch and Flemish paintings, Italian Renaissance sculpture, bronzes, furniture and carpets. His principal works have been translated.

Boden-See. See CONSTANCE, LAKE OF.

Bodenstedt, FRIEDRICH MARTIN VON, born in Hanover, 22d April 1819. In 1840 he went to Moscow as a tutor, and there translated Pushkin's poems. After extensive travels in the Crimea, Turkey, Greece, and Asia Minor, he returned to Germany in 1847, and published *Die Völker des Kaukasus* (1848). He edited a paper, was professor of Slav languages and of Old English at Munich, and from 1866 till 1873 superintendent of the Meiningen court theatre. He published many translations from the Russian, English (Shakespeare), and Persian, several volumes of poetry, and an autobiography. His *Lieder des Mirza Schaffy* (1851), feigned to be a translation from the Tatar, passed through nearly 150 editions within fifty years. He died in April 1892.

Bodichon, MADAME (1827-90; Barbara Leigh Smith, who, daughter of a Norwich M.P., married Dr Eugène Bodichon in 1857), was a water-colour painter, a founder of Girton College, and an advocate of women's rights.

Bodin, JEAN, a great political thinker of the 16th century, was born at Angers about 1530. After his studies in law at Toulouse, he settled in Paris. By Henry III. he was appointed king's attorney at Laon in 1576, and by the Duc d'Alençon he was carried as secretary to England in his journey to solicit the hand of Queen Elizabeth. In the States-general at Blois in 1576 Bodin asserted with great energy and eloquence the rights of the people and freedom of conscience. The later years of his life were spent at Laon, the inhabitants of which he was able to persuade to declare for the League in 1589, and for Henry IV. five years later. Here he died of the plague in 1596. Bodin's greatest work is *Les Six Livres de la République* (1576), of which the author issued a Latin version in 1586. According to Bodin, property and the family form the basis of society, and a limited monarchy is the best possible form of government. In opposition to certain contemporary Protestant writers on politics, he held that under no circumstances are citizens justified

in rebelling against their ruler. One prince, however, may interfere in behalf of the oppressed subjects of another. Bodin's book is the greatest of its kind published during the 16th century; yet it had but little influence on contemporary opinion. His *Methodus ad Facilem Historiarum Cognitionem* (1566) is considered by some writers as having laid the foundation of the true philosophy of history. His famous *Colloquium Heptaplomeres de Abditis Rerum Sublimium Arcanis*, left in MS., and indeed not published until 1857 by Noack, is a conversation between a Jew, a Mohammedan, a Lutheran, a Zwinglian, a Roman Catholic, an Epicurean, and a Theist, who come to the conclusion that henceforward they will leave off disputing on religion, and live together in charity and toleration. Bodin, though so broad and liberal in his opinions as to earn the reputation of an atheist, was not before his age in his notions about witchcraft, as is evidenced by his *Demonomanie des Sorciers* (1580). See H. Baudrillart's *Jean Bodin et son Temps* (1853); Renz, *Jean Bodin* (1905); and vol. i. of Flint's *Philosophy of History in Europe* (1874).

Bodle, an ancient Scottish copper coin of the value of two pennies Scots, or (about 1600) one-sixth of an English penny; said to have been so called from a mint-master of the name of Bothwell.

Bodleian Library, the public library of Oxford University, restored by Sir Thomas Bodley (q.v.) in 1598, his first act being the presentation of a large collection of valuable books, purchased on the Continent at an expense of £10,000. Through his influence and noble example, the library was speedily enriched by numerous other important contributions. Among the earliest subsequent benefactors of the Bodleian Library, which was opened in 1603, with a well-assorted collection of upwards of 2000 volumes, were the Earl of Pembroke, who presented it with 250 volumes of valuable Greek MSS.; Sir Thomas Roe; Sir Kenelm Digby; Robert Burton, author of the *Anatomy of Melancholy*; and Archbishop Laud, who made it a magnificent donation of 1300 MSS. in more than twenty different languages. Upwards of 8000 volumes of the library of the famous John Selden (q.v.) went to the Bodleian Library. General Fairfax presented the library with many MSS., among which was Roger Dodsworth's collection of 160 volumes on English history. The greatest benefactor in the 18th century was Dr Richard Rawlinson, who, dying in 1755, left his complete collection of books and MSS. to the Bodleian Library. The MSS. amounted to upwards of 4800. George Ballard, who died in the same year (1755), bequeathed to the library 44 MS. volumes of interesting letters, with other valuable MSS. During the nineteenth century the most important bequests were the collections of Richard Gough, on British Topography and Saxon and Northern Literature; the choicest books from the library of Edmund Malone, the editor of Shakespeare; and the valuable books, prints, drawings, and coins of Francis Douce; also a sum of £40,000, by the Rev. Robert Mason, the interest to be expended on books. By purchase, the library acquired some magnificent collections of Oriental, Greek, Latin, and Hebrew books and MSS. The Bodleian Library is particularly rich in biblical codices, rabbinical literature, and materials for British history. By the Copyright Act it is entitled to a copy of every book printed in the United Kingdom. The number of volumes it possesses is estimated at about 1,000,000, in addition to some 40,000 or 50,000 in manuscript. The first catalogue of the printed books was published by the first librarian, Dr James, in 1605; the last, nearly two centuries and a half later (1843-51), in 4 vols., by

Dr Bandinell, the eleventh who held the office since the institution of the library. In the interval, several catalogues of various departments of the library were published; and a supplemental volume was added by Dr Bandinell in 1851. By statutes drawn up for the government of the library by Sir Thomas Bodley, it was decreed that the vice-chancellor, the proctors, and the regius professors of divinity, law, medicine, Hebrew, and Greek, should be visitors and curators; a statute passed in 1856 added 'five more residents to be elected by congregation for ten years, if continuing to reside, and to be re-eligible.' Since 1861 the domed Radcliffe Library (now *Camera Bodleiana*) has served as a reading-room, and contains the books most commonly in demand. It was built to contain the library of the famous physician Dr John Radcliffe (q.v.) with money left by him for the purpose. The Bodleian contains, besides books, collections of 50,000 coins, of drawings, of models of temples and ancient buildings, of antiquities, and autographs, and a gallery of portraits. Literary men properly recommended are allowed to make extracts from the works in the library. Books neither rare nor valuable may be lent, by vote of Convocation, to persons working in other institutions of the university, and, by the authority of the librarian or curators, to professors of the university. See Macray, *Annals of the Bodleian Library* (1868; 2d ed. 1890).

Bodley, SIR THOMAS, the restorer of the library originally established at Oxford by Humphrey, Duke of Gloucester, was born at Exeter, March 2, 1545. His family, being forced to flee from England during the persecutions of Mary, settled at Geneva, where Bodley studied languages and divinity under the most distinguished professors of that city. On the accession of Elizabeth he returned to England and completed his studies at Oxford, where he took the degree of M.A., was afterwards elected a proctor, and officiated as public orator. He applied himself to the study of Hebrew, and four years spent abroad enabled him to become proficient in modern languages. He was now employed by the queen in diplomatic missions to Denmark, France, and Holland, and returned to his favourite city, Oxford, in 1597, where he devoted himself to literature, especially to the extension of the university library, now called the Bodleian (q.v.) in Bodley's honour. In collecting rare and valuable books from many parts of Europe, Bodley expended a very large sum, and also left an estate for salaries to officers, repair of the library, and purchase of books. He was knighted by King James, and died at Oxford, January 28, 1613. Having no family, he made the university his chief heir. Bodley's autobiography, extending to the year 1609, together with a collection of his letters, has been published under the title *Reliquiæ Bodleianæ* (1703).

Bodmer, JOHANN JAKOB, a Swiss poet and *littérateur*, was born at Greifensee, near Zurich, in 1698. The study of the Greek and Latin writers, together with the English, French, and Italian masters, having convinced him of the poverty and tastelessness of existing German literature, he resolved to attempt a reformation. Accordingly, in 1721, along with a few other young scholars, he commenced a weekly review, *Diskurse der Maler*, in which the living poets were sharply handled. After 1740, when Bodmer published a treatise on the Wonderful in Poetry, a famous literary war broke out between him and Gottsched, the pedantic dictator of German literature. Bodmer's followers, the Swiss school, who were nourished on English poetry, maintained the claims of imagination and free poetic impulse against poetry according to hard and fast rules. The controversy partly prepared

the way for the Augustan epoch of German literature. Bodmer died at Zurich, where he had held the chair of History for fifty years, 2d January 1783. As an author, he was marked by inexhaustible activity; but his poems, dramas, and translations have no vigour or originality. He did greater service to literature by republishing the old German poets, the Minnesingers, and a part of the *Nibelungenlied*, as also by his numerous critical writings.

Bodmin, the county town of Cornwall, in the middle of the county, 30 miles NNW. of Plymouth. It has some trade in cattle and sheep, and shoes are manufactured. The chief buildings are a market-house, the county hall, and the Cornwall Lunatic Asylum. Bodmin arose out of a priory, which, founded in 936 or earlier, came at the Reformation into Sternhold's hands. The church, rebuilt in 1472, has been restored since 1879. From the time of Edward I. till 1868, Bodmin returned two members to parliament; then, till 1885, one. Pop. 5500.

Bodock. See BOIS D'ARC.

Bodoni, GIAMBATTISTA, a distinguished Italian printer, born in Piedmont in 1740, settled at Parma in 1768, and died at Padua in 1813. His edition of the *Iliad* and of Virgil, as also his Lord's Prayer in 155 languages, are admired for their elegance. See the Life by Bernardi (1873).

Böttcher, LUDVIG, one of the most finished poets the North has produced, was born at Copenhagen in 1793, and after a long residence in Italy, returned home in 1835, to die there in 1874. His poems are mainly love songs, and form but two small collections; but almost every one of them is a gem. See Gosse's *Northern Studies* (1879).

Boduognatus, chief of the Nervii, fell in battle against the Romans on the Sambre, 57 B.C.

Body, HUMAN, will be treated of under the names of the several organs and functions, a list of which is given at ANATOMY.

Body-cavity, in the wide sense, is the space enclosed by the body-walls of an animal, and enclosing the gut and other organs. But this space is not by any means homologous in all animals, and the more precise term *cœlom* was invented by Haeckel to designate the cavity known in Vertebrates as 'pleuroperitoneal.' It is the cavity from the walls of the germ-cells (ova and spermatozoa) develop, or which forms around these cells. It arises in development from pouches growing out from the primitive gut or archenteron, or by the splitting of solid mesoderm rudiments. It is lined by mesoderm; it is separate from the blood channels; it often contains a perivisceral fluid. A true *cœlom* is very clearly seen in Vertebrates and adult Echinoderms, where it is the cavity into which one cuts in opening an animal. But in many animals the cavity of the body is not a true *cœlom*, and the whole subject is very difficult. The best account of the *cœlom* is to be found in Lankester's *Treatise on Zoology* (1900), Part ii. chap. ii.

Body Colour, a term applied to such pigments as have body enough to be opaque, as distinguished from those which are transparent. As a general rule, pigments have more body the nearer they approach to white; consequently the light parts of pictures in oil are in body colour to give them brightness and strength, while the dark parts are transparent to give them depth. Water-colour painting, when executed by mixing the pigments with white after the manner of an oil-painting, is said to be painted in body colour.

Body's Island, a long, narrow strip of sand, off North Carolina, with a lighthouse (150 feet), the highest in the United States.

Boece (or, more properly, BOYIS), HECTOR, a distinguished Scottish historian, was born of an old family about 1465 at Dundee. He completed his education at Montaigu College, in the university of Paris, where from about 1492 to 1498 he was a regent or professor of Philosophy. Among other learned men whose friendship he acquired here was Erasmus. About the beginning of the 16th century he was invited by Bishop Elphinstone to preside over the university newly founded by him at Aberdeen. Boece accepted the office after some natural hesitation, the yearly salary being but 40 merks, or about £2, 4s. 6d. sterling. The value of money, however, it has to be remembered, was immensely greater then than now, and the learned principal was at the same time made a canon of the cathedral, and chaplain of St Ninians. During his tenure of office the university was highly prosperous and produced many excellent scholars. In 1522 he published his lives, in Latin, of the Bishops of Mortlach and Aberdeen. This work, a great part of which is occupied with the life of his excellent patron, Bishop Elphinstone, was reprinted by the Bannatyne Club in 1825. In 1527 Boece published the Latin *History of Scotland*, on which his fame chiefly rests, a work which, though proved to contain a large amount of fiction, was deemed distinctly critical at the time of its publication. The author was rewarded by the king with a pension of £50 Scots, until he should be promoted to a benefice of 100 merks, which appears to have occurred in 1534. By the excellence of his Latin style, and his sympathy with Erasmus, Boece may fairly be counted a humanist. He died in 1536, and was buried in the chapel of King's College. See BELLENDEN, JOHN.

Boeckh, PHILIPP AUGUST, classical antiquary, was born at Karlsruhe, November 24, 1785, and entered the university of Halle in 1803. The prelections of Wolf determined him to the science of philology, of which, in 1809, he became professor at the university of Heidelberg. In 1811 he was translated to the chair of Rhetoric and Ancient Literature at Berlin, where he lectured for upwards of forty years, and where he died, August 3, 1867. Boeckh's conception of philology as an organically constructed whole aimed at nothing short of an intellectual reproduction of antiquity, and consequently excited for a long time great opposition among his professional contemporaries, but it undoubtedly gave an impetus to a deeper study of the old classical world. His lectures include not merely a grammatico-historical interpretation of the ancient authors, but also archaeology proper, the history of ancient literature, philosophy, politics, religion, and social life. His four great works, which have in fact opened up new paths in the study of antiquity, are (1) his edition of Pindar (2 vols. 1811-21), in which the metre and rhythm of the poet, as well as his artistic skill, are investigated and discussed with profound knowledge of the subject; (2) *Die Staatshaushaltung der Athener* (2 vols. 1817; 3d ed. by Frankel, 1887), a work which remains unsurpassed for subtle research, surprising results, and clear exposition: it was translated into English by Sir George Cornewall Lewis under the title of *The Public Economy of Athens* (1828); (3) *Metrolologische Untersuchungen über Gewichte, Münzfusse, und Masse des Altertums* (1838); (4) *Urkunden über das Seewesen des Attischen Staats* (1840). His lesser works are all valuable, and besides investigations in ancient chronology, editions of the *Antigone* of Sophocles (1843), and of the fragments ascribed to Philolaus (1819), and dissertations on Plato's cosmical system, include lectures and critiques collected under the title *Gesammelte kleine Schriften* (7 vols. 1858-74). Boeckh has also the honour of having commenced in

1824 the great work entitled *Corpus Inscriptionum Græcarum*, published at the expense of the Royal Academy of Berlin, and continued by Curtius. See a work on him by Max Hoffman (2 vols. 1901).

Boehm, SIR JOSEPH EDGAR, sculptor, was born in Vienna, July 6, 1834. He was educated from 1848-51 in England, and finally settled there in 1862. He had previously gained the first imperial prize in Vienna in 1856, and his work soon attracted notice in the country of his adoption. In 1867 he executed a colossal statue of the Queen, and afterwards received commissions for statues or busts of a large number of distinguished personages. Of the seated statue of Thomas Carlyle, enthusiastically praised by Mr Ruskin in his Royal Academy Notes, 1875, a replica was erected at Chelsea. His animal studies are also noteworthy. Boehm was elected a member of the Academy of Florence in 1875, an A.R.A. in 1878, and a member of the Academy of Rome in 1880. He was nominated in 1881 sculptor-in-ordinary to the Queen, and was made an R.A. in 1882, a baronet in 1889.* The Queen's effigy on the coinage issued in 1887 was from his designs. He died 12th December 1890.

Boehme, JAKOB, a German theosophist and mystic, was born of poor parents at Altseidenberg, near Görlitz, in Upper Lusatia, 1575, and spent his boyhood in tending cattle. He received no instruction till he was ten years of age; but even then, the contemplation of earth and sky had so excited his naturally pious imagination, that he conceived himself inspired. He learned the trade of a shoemaker, and industriously followed that calling for most of his life, but continued to devote much of his time to meditation on divine things. About 1612 was published his first book, called *Aurora*. It contains revelations and meditations upon God, Man, and Nature; betokens a remarkable knowledge of Scripture, especially of the apocalyptic books; as also a familiarity with the writings of the mystico-philosophic alchemists, from whom he largely obtained his phraseology. It was condemned by the ecclesiastical authorities of Görlitz; but the persecutions to which its author was subjected had not the effect of convincing him of his errors. The chief aim of Boehme is to explain the origin of things, especially the existence of evil, and this he does by a mystical process of thought expressed in material symbols, which it is not easy to summarise.

God is the *Ungrund* or *Urgrund*, the original and undistinguished unity, at once everything and nothing, which, however, has in itself the principle of separation, whereby all things come into existence. It is through the principle of negation, which in a way is identified with evil, that creation is explained. His philosophy, in fact, is an application of the principle of contradiction to explain the great problems of philosophy and religion; but the difficulties are only concealed or shifted about under a cloud of mystical language, in which a system of triads, suggested by the Christian doctrine of the trinity, have an important place. In Boehme we have an obscure presentation of the thesis, antithesis, and synthesis, which have such a large application in the philosophy of Hegel. Numerous attacks from theologians disturbed Boehme's last years, but he bore them all with great meekness. So great was the interest excited, that he was induced by the solicitations of certain courtiers and of his friends to visit Dresden for the purpose of having his doctrines investigated. The court applauded and protected him. On returning to Görlitz, he fell ill, and died in 1624. The first collection of his writings was published by Betke (Amsterdam, 1675); the most complete in 1730, at the same place; and the latest (1831-46) by Schiebeler, at

Leipzig. Next to Germany, Holland and England are the countries in which Boehme's works have been received with most favour. In England, where Boehme was generally called Behmen, all his works were translated between 1644 and 1662 (new ed. 1909 *et seq.*). Sir Isaac Newton studied him; William Law of Oxford might be called a disciple; in 1697 Jane Leade, a fanatical disciple of Boehme, founded a sect, called the Philadelphians (q.v.), for the exposition of his writings; and John Pordage, a physician, is also famed among his English interpreters. Abraham von Frankenberg, who died in 1652, published the earliest biography of Boehme. In modern times, and in connection with speculative philosophy in Germany, his views, which had come to be regarded as empty mysticism, have acquired fresh interest and importance. This arises from the kindred character of his fundamental principle with the spirit pervading the systems of Spinoza, Fichte, Schelling, and Hegel. See the works on Boehme and his philosophy by Hamberger (1844), Fechner (1857), Peip (1860), Harless (1870), Martensen (Eng. trans. from Danish, 1885), and Deussen (1911).

Boehmeria, a genus of Urticaceæ (q.v.), of which two species, or rather what were formerly considered as two distinct species, have been from a remote period cultivated in the East. The Indian variety was called by Roxburgh *Urtica tenacissima*, and the Chinese one *Boehmeria nivea* by Gaudichaud.

They are now distinguished as varieties, the one being called *B. nivea* and the other *B. nivea*, var. *candicans*. There are said to be other doubtful species. The fibre from *Boehmeria* has long been used in eastern countries for ropes and for cordage, and also for cloth in China and in Japan. This fibre is known in commerce as Rhea, as Ramie, or as China-grass, and has been much used for sails, tablecloths, and especially the manufacture of incandescent gas mantles. For this purpose, however, it is giving way before artificial silk (see SILK, ARTIFICIAL), from which more uniform, and therefore more robust and durable, mantles can be made. If all the several locally distinguished forms of the plant be reckoned, it has a very wide range, being found in several parts of India, China, Japan, and the Eastern Archipelago generally. It has been successfully introduced into a number of foreign countries, including the Cape, Mauritius, Algeria, the south of France, California, Louisiana, and some of the West Indian Islands. It may be propagated by cuttings, which can be readily grown, by roots, or by suckers, and it thrives best in moist shady places in the tropics.

Boehmeria nivea:
a, male flower; b, glomerule of female flowers; c, single female flower; d, pericarp.



the manufacturer except by a somewhat costly process. The preparation of the fibre by hand-stripping involves much labour. Machine methods had been experimented with for many years ere a process was found by which it could be prepared so as to be sold at a remunerative price; but now the manufacture promises to become an important industry. The plant abounds in gum, the removal of which without injury to the fibre is another difficulty.

In some respects rhea is the most remarkable of all known vegetable fibres. For fineness, strength, and lustre combined it excels any of them. It can be spun at least as fine as flax, is stronger, and has a more silky lustre. Jute has also this lustre, but it has neither the strength of rhea nor its capability for bleaching and dyeing. Rhea has the additional advantage of being liker wool in its nature than other plant-fibres, and it can be used as a substitute for long-stapled wool.

Bœotia, one of the ancient political divisions of Greece, extended between Attica and Megara on the south, and Locris and Phocis on the north, with an area estimated at 1120 sq. m., or a little larger than Cheshire. The mountain-closed country falls naturally into five divisions—the basin of the Lake Copais, now called *Topolias*, that of the Asopus, the plain of Thebes, and the coast-districts on the Eubœan and the Corinthian Gulf. The principal stream was anciently called the Cephissus; which in the spring, when swollen by the rains, almost converted the Copaic plain into a lake. There were several subterranean channels for the outlet of the waters towards the Eubœan Sea, but they were not sufficient to carry them off; and in the days of Alexander the Great a vast tunnel was cut in the rock for the discharge of the water. After this fell into ruin, the district became marshy and unwholesome; and it was not till 1895-1900 that it was once more properly drained. The draining operations, carried to a successful completion, drained 60,000 acres of arable land, which now bear wheat, Indian corn, cotton, and other crops. Bœotia has always been fertile. Chromiferous iron ore is obtained.

Of the earliest inhabitants, the most powerful were the Minyæ, who were dislodged by the Bœotians, an Æolian people from Thessaly. The Bœotians excelled as cultivators of the soil, and were brave soldiers both on foot and horseback; but they were rude and unsocial, and took little part in the gradual refinement of manners and intellectual development of the rest of Greece, so that the name became proverbial for illiterate dullness. This was usually ascribed to their thick damp atmosphere. Yet their generals include Epaminondas; and among their poets and historians were Hesiod, Pindar, and Plutarch. The fourteen greater cities formed the Bœotian League, with Thebes at its head. Of this league, a shadow still remained down to the times of the Roman empire. See PLATEA, and THEBES.—Along with Attica, Bœotia now forms a department or nome of Greece, with an area of 2300 sq. miles, and a population of 582,000.

Boerhaave, HERMANN, the most celebrated physician of the 18th century, was born at Voorhout, near Leyden, December 31, 1668. In 1682 he went to Leyden, where he studied theology and oriental languages, and took his degree in philosophy in 1689. In 1690 he began the study of medicine, and took his doctor's degree in 1693. In 1701 he was appointed lecturer on the Theory of Medicine at Leyden, and in his inaugural lecture recommended to the students the ancient method of Hippocrates in medicine; but in 1703 his views had become greatly enlarged. In 1709 he was

elected professor of Medicine and Botany. About this time he published the two works on which his great fame chiefly rests, *Institutiones Medicæ* (1708), and *Aphorismi de Cognoscendis et Curandis Morbis* (1709), both of which were translated into various European languages, and even into Arabic. In the first work—a model of comprehensive and methodical learning—he gives a complete outline of the theory of medicine; in the second, a classification of diseases with their causes and modes of treatment. Boerhaave also rendered important services to botany. His best lectures include those delivered on his resignation of the office of rector of the university, *De Comparando Certo in Physicis* (1714), and *De Honore Medici, Servitute* (1736); in the latter of which he declares that to be the servant of nature is the highest aim of medicine. To combine practice with theory, he caused a hospital to be opened, where he gave clinical instructions to his pupils. Though so industrious in his own profession, he undertook in 1718 the professorship of Chemistry, and published in 1724 his *Elementa Chemicæ*, a work which did much to render this science clear and intelligible, and one, that will always occupy a high place in the history of chemistry. His fame had meanwhile rapidly increased. Patients from all parts of Europe came to consult him. Peter the Great of Russia visited him; and it is even said that a Chinese mandarin sent him a letter, addressed 'BOERHAAVE, celebrated physician, Europe.' His character was amiable and unassuming, and tinged with a deep but cheerful piety. He died September 23, 1738, having realised from his profession a fortune of two millions of florins. See Burton, *Account of the Life and Writings of Boerhaave* (2 vols. Lond. 1743); Johnson, *Life of Boerhaave* (Lond. 1834).

Boerhaavia. See NYCTAGINACEÆ.

Boers (Dutch, 'agriculturists,' 'farmers'), the name applied to the Dutch colonists of South Africa who are engaged in agriculture and the care of cattle. The first settlement of the Boers at the Cape of Good Hope dates from the 16th century, and they have since been reinforced by Huguenots from France, but they retain in a pronounced form the old Dutch character, especially the old Dutch love of freedom. After the final cession of the Cape to England in 1814 they disliked the new government, especially its friendly policy to the natives and the emancipation of the slaves in 1833. Accordingly, in 1835, bands of them 'trekked' northwards, and so occupied Natal, the Orange Free State, and the Transvaal. Latterly in England 'Boers' came to mean the Dutch of South Africa, especially of the two republics. In the Boer war of 1899–1902 they amply proved their strong physique and skill as marksmen, and bravery as fighting-men. After the war they took a conspicuous part in the constitution and government of the Union of South Africa. The Cape Dutch, or Taal, spoken by the Boers is a corrupt dialect, with a very limited vocabulary; a compromise between it and the Dutch of Holland (now called, erroneously, 'High Dutch') is preferred in law courts and higher schools. See CAPE OF GOOD HOPE, NATAL, ORANGE FREE STATE, SOUTH AFRICA, TRANSVAAL.

Boëthius (sometimes BOETIUS), ANICIUS MANLIUS SEVERINUS, a Roman statesman and philosopher, was born between 470 and 475 A.D. of a rich and illustrious family. His father had held the office of consul, but died while Boëthius was still a boy. Brought up under the care of men of rank, he studied with enthusiasm philosophy, mathematics, and poetry, translating and elucidating with laborious care the writings of Aristotle, Euclid, Archimedes, Nicomachus, and others. His talents soon attracted notice, and

having gained the esteem and confidence of Theodoric, king of the Goths, who had fixed the seat of his government at Rome in the year 500, he was appointed by that monarch *magister officiorum* in his court. His influence was invariably exercised for the good of Italy, and his countrymen owed it to him that the Gothic rule was so little oppressive. Boëthius was made consul in 510, and his good-fortune culminated in the prosperity of his two sons, who shared the same honour in 522. But his bold uprightness of conduct, springing apparently from his strong faith in the truth of his philosophic ethics, at last brought down upon his head the unscrupulous vengeance of those whom he had checked in their oppressions, and provoked by his virtues. He was accused of treasonable designs against Theodoric; and the king, having become despondent and mistrustful in his old age, was induced to listen to the charges. Boëthius was stripped of his dignities, his property was confiscated, and he himself, after having been imprisoned for some time at Pavia, was executed in 525; according to long subsequent accounts, with circumstances of horrible cruelty. During his imprisonment he wrote his famous *De Consolatione Philosophiæ*, in which the author holds a conversation with Philosophy, who shows him the mutability of all earthly fortune, and the insecurity of everything save virtue. The work is composed in a style which happily imitates the best models of the Augustan age, and the frequent fragments of poetry which are interspersed throughout the dialogue are distinguished by their truthfulness of feeling and metrical accuracy. The *Consolatio* is piously *theistic* in its language, but affords no indication that its writer was a Christian; and if the doctrinal treatises ascribed to him are, as the acutest criticism maintains, not genuine, we must class him in religion rather with Marcus Aurelius than with his alleged friend, St Benedict. Boëthius was the last Roman writer of any mark who understood the Greek language and literature. During the middle ages his translations formed to a large extent the medium by which men became acquainted with Aristotle; and his manuals on arithmetic, astronomy, geometry, and music were generally used in the schools.

Four editions of the works appeared between 1491 and 1847 (Migne). Of the *Consolatio* (often edited) many translations into various languages were made before the invention of printing, such as King Alfred's into English (ed. Sedgefield, 1899) and Chaucer's in English prose (published by Caxton, 1480). Later translations are Queen Elizabeth's (E.E.T.S. 1899), Colville's (1556; ed. Belfort Bax, 1897), I.T.'s (1609; ed. Stewart, 1918), H. N. James's (1897). H. F. Stewart, in *Boëthius: an Essay* (1891), holds that the philosopher was at least outwardly a Christian, and inclines to believe that the theological tractates ascribed to him were actually his. See Ker, *Dark Ages* (1904).

Boëthius, HECTOR. See BOECE.

Bog is spongy land covered with Peat (q.v.). Bogs of great extent exist in some of the northern parts of the world. A very considerable part of the surface of Ireland is occupied with them. The Bog of Allen (see ALLEN, BOG OF) is the most extensive in the British Islands. The Solway Moss (q.v.), on the western border of England and Scotland, is about 7 miles in circumference. Chatmoss (q.v.) in Lancashire is 10 sq. m. in extent. There are large bogs in some of the Hebrides and the Orkneys. The swamps of the east of England are in general not peat-bogs, but consist chiefly of soft mud or silt.

The general surface of a bog is always nearly level, but it is usually varied with rushy tussocks rising above the rest, and having a rather firmer soil. By the continued growth of peat, the surface of a bog is gradually elevated; that of Chatmoss,

for example, rises above the level of the surrounding country, having a gradual slope of 30 or 40 feet from the centre to the solid land on all sides. Occasionally, the quantity of water becoming excessive owing to continuous rains, a bog *bursts*, and pours a terrible deluge down the course of a stream causing great devastation, not only by the force of its torrent, but by the enormous quantities of peat which it deposits upon meadows and cultivated fields, as has happened in some memorable instances in Ireland. In December 1896 a large bog of 200 acres burst at Rathmore, near Killarney; several lives were lost, and many miles of country laid waste. The depth of a bog is sometimes more than 40 feet. The spongy mass of which it is formed shakes on the least pressure. Sometimes it is impossible to traverse it; in other cases, it is possible only for those who are well accustomed to it, a false step being a plunge into a quagmire, in which a man sinks as in a quicksand. Safety is sometimes ensured by pattens for men and horses. Tradition reports that at the battle of Solway in 1542 a fugitive troop of horse plunged into the moss, which instantly closed upon them.

One of the remarkable phenomena of peat-bogs is the frequent presence of roots and fallen trunks of trees, in a good state of preservation, many feet below the surface (see **BOG-OAK ORNAMENTS**), and this frequently where no trees exist on the surface now. Two layers of buried trees, marking former land surfaces, appear commonly in the British bogs. Between these, in Scotland, a layer of Arctic plants is often intercalated, and a similar layer now and again occurs at the base of the deeper bogs. Bogs are popularly divided into two classes—*Red Bogs* and *Black Bogs*, the decomposition of the vegetable matter in the former being less perfect, and the substance consequently more fibrous and light, than in the latter. There is indeed no precise line of distinction, and all intermediate conditions occur. The most extensive and deepest bogs are the red bogs; black bogs are more numerous. See **BOG-PLANTS**.

There can be no doubt that much of the land now occupied by bog is capable of being rendered very productive, whilst the effects of extensive bogs upon the climate are always injurious. The reclaiming of shallow mountain bogs is comparatively easy, and in some cases it is effected by a very simple and inexpensive drainage, and by throwing them at once under cultivation in a manner analogous to that known in Ireland as the *lazy-bed* method of planting potatoes—the soil upon which the bog rests being partially dugged up and thrown over its surface. Great difficulties, however, attend the reclaiming of red bogs; the chief being in some cases caused by the low situation of the bog, and the want of *fall* for drainage. Another serious obstacle is presented by the spongy substance of red bogs being extremely retentive of water, so that a deep ditch only drains a very narrow strip on either side of it. Drainage is certainly effective only when the drains are cut through the peat into the underlying soil, and this operation is often too costly. Where a good soil is known to exist below, the peat is sometimes removed bodily; thus it has been floated off, as in the long-continued operations at Blair-Drummond, on the banks of the Forth. A portion of the peat taken from the upper surface is not infrequently burned in heaps upon the spot, the ashes becoming a manure, and assisting in the formation of a soil.

Of course, the first essential in the reclaiming of bogs is drainage. The method of effecting this must be varied according to circumstances; but very frequently, after a general outlet with sufficient fall has been secured, wide open drains are cut, by which the bog is divided into strips,

which again are traversed and subdivided by smaller drains. When these drains begin to serve their purpose, the surface of the bog sinks, and their depth is reduced; they are then often deepened, and at last a permanent system of covered drains emptying themselves into open ditches is thus formed, and fits the land for all the purposes of agriculture. It is, however, often ploughed before this state of things is attained. A heavy dressing of lime, preferably quicklime, may usually be very advantageously applied in order to promote the conversion of the peat into useful soil. Sometimes the first crop taken from the ploughed bog is a crop of oats; sometimes it is found preferable to begin with rape, turnip, or the like. In some places in the north of Ireland florin grass (see **BENT-GRASS**) has been sown on bogs in process of being reclaimed, and enormous crops have been obtained. See **WASTE LANDS**.

Bogardus, JAMES, American inventor, born in Catskill, New York, 14th March 1800, was apprenticed to a watchmaker, and early showed the bent of his mind by improvements in the construction of eight-day clocks, and by the invention of a delicate engraving-machine. The dry gas-meter is his invention, as is also the transfer-machine to produce bank-note plates from separate dies; and in 1839 his plan for manufacturing postage-stamps was accepted by the British government. Later he introduced improvements in the manufacture of india-rubber goods, tools, and machinery; and invented a pyrometer, a deep-sea sounding-machine, and a dynamometer. He died at New York, 13th April 1874.

Bog Asphodel (*Narthecium ossifragum*), a pretty liliaceous herb, with a characteristic raceme of small golden-yellow star-like flowers, common in early autumn on boggy mountain-sides in northern temperate regions.

Bogatzky, KARL HEINRICH VON, a German devotional writer, was born at Jankowe in Lower Silesia, 7th September 1690. Coming under the influence of Francke, the pietist, he studied theology at Halle from 1715 to 1718. He was a long time in the service of various noble houses of Silesia, and afterwards lived some years at the Silesian village of Glaucha, engaged in the organisation of an orphanage there. In 1740 he was received into the family of the Duke of Sachsen-Saalfeld, and on the duke's death he removed to Halle in 1746, where he spent the rest of his life in writing books of devotion, and died 15th June 1774. His chief work is *Das güldene Schatzkästlein der Kinder Gottes*, well known in English translations as *Bogatzky's Golden Treasury*. He wrote also many popular hymns. See his autobiography (new ed. 1872).

Bog-bean. See **BUCK-BEAN**.

Bog Butter (**BUTYRITE** or **BUTYRELLITE** of mineralogists), found in some of the bogs of Ireland, was till 1885 supposed to be of vegetable origin, and due to the decomposition of the peat amidst which it is found. It resembles butter in colour and consistency, and becomes liquid at about 124° F., and is now known to be adipocere constituted by the partial decomposition of butter in contact with air. According to Dingley's travels (about 1680), it was customary in Ireland to treat butter with garlic and sink it in the bog to give it a high taste for Lent; and Petty speaks of butter made rancid by keeping in a bog. See *Notes and Queries*, May 1906 (p. 416), and Joyce's *Social Ireland*.

Bogdanovich, IPPOLYT FEDOROVICH, a Russian poet, born in 1743, became president of the imperial archives in 1788, and died near Kursk in 1803. The mock-heroic *Dushenka* (1778), the best

of his poems, is based on the story of Psyche, and is characterised by a refined and graceful style, and vivacious playfulness of language. His works were collected in 6 vols. (1810).

Bogermann, JOHANN, the president of the famous Synod of Dort, was born in 1576, at the Frisian village of Oplewert. After studying at Heidelberg and Geneva, he became pastor at Leeuwarden, and soon distinguished himself by the active part he took in the hot religious controversies of his time, especially that against Arminius. In 1618 he was elected president of the Synod of Dort; but his name is now remembered only for his standard translation of the Bible into the Dutch vernacular. He died in 1633, professor of Divinity, at Franeker.

Boghaz-Keni, a village of Asia Minor, 90 miles E. of Angora, near which are extensive ruins and characteristic sculptures, now recognised as Hittite. The place, doubtfully identified with the ancient Pteria, was unquestionably an important seat of Hittite power and culture. Previously the capital of a minor Hittite state, it was the chief centre of the whole empire or confederacy for two centuries (about 1400-1200 B.C.), and the repository of its archives, in the form of clay tablets inscribed with cuneiform characters. See HITTITES, and books by Hamann and Puchstein (1890), Chantre (1898), Winckler, who conducted important excavations here in 1906-7, and Hrozný; and Cowley, *The Hittites* (1920).

Boghead Coal (TORBANITE or BITUMENITE), a seam met with in the Carboniferous system in the lands of Torbanehill, Bathgate, Scotland. It is rich in Paraffin (q.v.). It is not properly a coal, but rather a bituminous clay or shale.

Bog Iron-ore, a mineral of very variable composition, but regarded as consisting essentially of peroxide of iron and water; the peroxide of iron often amounts to about 60 per cent., the water to about 20. Phosphoric acid is usually present in quantities varying from 2 to 11 per cent. Silicic acid, alumina, oxide of manganese, and other substances, which seem accidentally present, make up the rest. Bog iron-ore occurs chiefly in alluvial soils, in bogs, meadows, lakes, &c. It is of a brown, yellowish-brown, or blackish-brown colour. Some of its varieties are earthy and friable, formed of dull dusty particles; some are in masses of an earthy fracture, often vesicular; and some more compact, with conchoidal fracture. It is abundant in some of the northern and western islands of Scotland, and in the northern countries of Europe generally; also in North America. When smelted it yields good iron (see IRON, ORES OF). Bog iron-ore owes its origin to the chemical action of organic acids arising from the decomposition of plants. These acids attack and dissolve the salts of iron which they meet with in the rocks and soils. The solutions thus formed, when they are exposed to the air, become oxidised, and iron is thus precipitated in the form of hydrous ferric oxide, which, along with the various impurities mentioned above, forms bog iron-ore. This mineral occurs frequently in boggy or badly-drained land, forming the hard ferruginous crust known in Scotland as 'moorland-pan.' According to Elhrenberg, the bog iron-ore in the marshes about Berlin owes its origin largely to diatoms.

Bogle, GEORGE (1746-81), born near Bothwell, was sent by Warren Hastings, in the service of the East India Company, to Tibet, where he established friendly relations with the Lama. In 1779 he was made collector at Rangpur. See Sir Clements Markham's book on the expedition (1876).

Boglipur. See BHAGALPUR.

Bog Moss. See SPHAGNUM.

Bog Myrtle, GALE, or SWEET GALE (*Myrica Gale*), an aromatic and resinous shrub, with small

lanceolate and serrate gland-dotted leaves, the only genus of the archichlamydeous order Myricaceæ. It covers large areas of bog and of wet moorland in northern regions, and was formerly put to many domestic uses. Its twigs were used to make beds, and to keep away moths and other insects, while its shoots and leaves served as a substitute for hops, its leaves were mixed with tobacco, and wax was obtained from its berries. See CANDLEBERRY.



Bog Myrtle:

a, male catkin; b, female catkin.

Bognor, a Sussex watering-place, 9½ miles SE. of Chichester by rail. Founded in 1786 by a London hatter, Sir R. Hotham, it has an iron pier (1865) 1000 feet long, and a good esplanade, restored since the great storm of 1876. Pop. (1861) 2523; (1911) 8142; (1921) 13,300. For the geological strata called Bognor beds, see EOCENE SYSTEM.

Bog-oak Ornaments. In the peat bogs of Great Britain, Ireland, and other northern countries, trunks of oak, yew, fir, and other woods, which have been long buried, are often found of a dark colour and well preserved, owing to the antiseptic properties of the peaty water. Black oak so found is very suitable for turning and carving. In Dublin a considerable trade is carried on in bog-oak jewelry and other ornaments. The articles made are small models of Irish buildings, Paddy and his pig, brooches, necklaces, fans, crosses, and other trinkets. Upon some of these the harp and the shamrock are frequent adornments. Some patterns of the kind that used to be carved are now stamped by a heated die placed in a screw-press. A large proportion of the so-called bog-oak ornaments of the present day are made from ebony, or from artificially stained oak. The trade originated in 1821, and it still continues to be a feature of Dublin industry. Were more attention bestowed on artistic design and on the utility of the products the trade might be capable of considerable expansion. In these respects bog-oak still leaves very much to be desired.

Bogodukhof, a town of Ukraine, on the Merla, 43 miles NW. of Kharkoff. It has a cathedral, an important leather industry, and much trade in cattle. Pop. 12,000.

Bogomil'i (Slav., 'lovers of God'), a religious sect which arose in the 12th century within the Greek Church in Thrace and Bulgaria. Their theology was dualistic, and resembled that of the Paulicians and Cathari. Out of the eternal Divine Essence or Being sprang two principles—Satanal and Logos; the former, at first good, afterwards rebelled, and created in opposition to the original spiritual universe a world of matter and human beings. These human beings, however, received from the Supreme Father a life-spirit; but this was kept in slavery by Satanal until the Logos or

Christ came down from heaven, and assuming a phantom body, broke the power of the evil spirit, who was henceforth called only Satan. The Bogomili practised a severe asceticism, despised images, and rejected the sacraments. They accepted the whole of the New Testament, but of the Old Testament only the Psalms and Prophets, which they interpreted allegorically. In 1118, that vehement hater of heretics, Alexius Comnenus, burned their leader Basilus. Persecution, however, did not put an end to the Bogomili, and to the time of the Mohammedan conquest of Bosnia (16th century), we find that the greatest number of the renegade Christians who embraced the religion of the conquerors belonged to this sect. Bogomil graves and monuments are common in Bosnia. See Asbóth's *Bosnia and Herzegovina* (trans. 1890), and the article MANICHEUS.

Bogotá, or SANTA FÉ DE BOGOTÁ, in South America, the capital of the Republic of Colombia, is situated in the province of Cundinamarca, on a tableland which, at an elevation of 8694 feet above the sea, separates the basin of the Magdalena from that of the Orinoco. The tableland has an area of about 400 sq. m., and is bounded on all sides by mountains which, though lofty enough to give shelter, are yet below the line of perpetual snow. This extensive plain—a temperate zone on the verge of the equator, with a salubrious climate and an average temperature of 60° F.—is exceedingly fertile, being as rich in pasture as in grain. The greater number of its people, however, are sunk in poverty. This is largely due to the heavy cost and difficulty of transport, which hamper all industries. Bogotá is the great commercial centre for the inland territory, and is now connected by railway with its port, Honda, the head of navigation on the Magdalena River (a distance of between sixty and seventy miles); as also with La Dorada and Jirardot on the same river. The few manufactures of the place include soap, leather, cloth, and articles made from the precious metals. Bogotá was founded in 1538, and in 1598 became the capital of the Spanish viceroyalty of New Granada; since 1554 it has been the seat of an archbishop, who has four suffragans. In 1800 it contained 21,464 inhabitants; in 1821, 30,000; in 1884, 95,813; and in 1918, 143,994. Prospectively, the surrounding mountains promise one day to give to industry many valuable minerals, such as iron, coal, and salt. The last two, in fact, have already been obtained to some extent. Mines of emeralds, gold, silver, and copper are also said to exist within the same district. The town is regularly and handsomely built, although most of the houses have but one story, and little glass, owing to the prevalence of earthquakes. The streets are at right angles, and paved and lit, but not over clean. Bogotá teems with churches, its cathedral being famous for a statue of the Virgin, which is covered with costly jewels; its convents were suppressed in 1861. It likewise possesses, in addition to the capitol, a palace for the national chambers, and other official buildings, a mint, a university with six faculties, a number of schools, a free library, observatory, two theatres, and museums; and, supporting about forty journals, the city has been proudly named by its inhabitants the 'Athens of South America.'—The river Bogotá, otherwise called the Funcha, is in itself an object of physical interest. It is the single outlet of the waters of the tableland, which, both from geological features and from aboriginal traditions, appears to have once been a land-locked basin, somewhat like the still loftier and larger plateau of Titicaca. Be this as it may, the river has found, if it has not forced, a passage for itself towards the Magdalena. At the cataract of Tequendama the waters plunge

over a precipice 625 feet high, their force having hollowed out a well 130 feet deep in the rock below; and the clouds of spray clothe the adjacent ground in the most luxuriant vegetation. Some miles from the fall stands the natural bridge of Icononzo, formed as if by the fortuitous jamming of rocks from the opposite sides of the cleft; and the plateau also contains a lake, Guatavita, into which the natives are said to have thrown their treasures when conquered by the Spaniards.

Bog-plants. The extensive areas, especially in the colder regions of the northern hemisphere, which are covered by bogs and marshes, have a highly characteristic flora which is distinct from the fully Aquatic Plants (q.v.) on the one hand, and from the ordinary terrestrial flora on the other. The most important and widely distributed of bog-plants are the bog-mosses (*Sphagnum*), of which the steady upward growth has formed the bulk of our peat-mosses; but higher cryptogamic plants also occur, notably the horsetails (*Equisetum*), and occasionally also rarer forms like *Pilularia* and *Marsilea*. Many sedges and rushes, reeds and grasses, are also highly characteristic, most of all perhaps the curious cotton-grass (*Eriophorum*), while heaths constantly struggle for possession of the drier and denser spots. The Bog-myrtle, q.v. (*Myrica Gale*) often overspreads vast areas with its low, scanty brushwood, above which rise only occasional tufts of willow, or at most here and there an alder. The insectivorous plants are perhaps the most characteristic minor denizens, sundews (*Drosera*) and butterworts (*Pinguicula*) being thickly strewn, while the rarer blossoms of the bladderwort (*Utricularia*) rise golden from their stagnant pools. The margins of these are fringed by the beautiful bog-bean (*Menyanthes*) and the smaller and less spreading forget-me-nots (*Myosotis*), or in spring are gay with marsh-marigolds (*Caltha*) and ranunculuses; while the brown blossoms of the marsh-potentilla (*P. Comarum*), the purplish-pink louseworts (*Pedicularis*), and the curious yellow-rattle (*Rhinanthus*) make their appearance later in summer.

The progress of agriculture completely destroys this flora, hardly a single bog-plant, save the versatile *Polygonum amphibium*, being able to survive thorough drainage. Many beautiful bog-plants can, however, be easily cultivated where a supply of standing water renders possible an artificial re-establishment of their natural conditions, or at anyrate, the continual soaking of their garden border, which should, of course, contain a large proportion of peat. For the geological agency of bog-plants, see PEAT. See also ECOLOGY.

Bog Spavin. This singular name has been applied to a lesion of the hock-joint of the horse, consisting in distension of the capsule enclosing the joint. Sometimes arising suddenly from a sprain in action, it most commonly affects young horses with defective hocks, and is associated with other indications of weakness in the injured joint, such as thorough-pin. As the immediate result of a violent sprain, the hock becomes swollen, hot, and tender, and there is considerable lameness. The acute symptoms subside readily, but a circumscribed swelling remains towards the front, inner, and lower part of the joint. The swelling is firm and tense, but fluctuating, and partly disappears during exercise, to reappear after rest. At every recurring strain, lameness supervenes, but commonly passes off within a short time. If the bog spavin has accidentally occurred in a young horse with good hocks, it may after disappearance of the acute symptoms never again be attended with inconvenience. The treatment of bog spavin consists in the application of a high-heeled shoe,

without a toe-piece, to the foot; the administration of a purge, soft diet, and rest; and the application of fomentations and mild stimulants to the part, succeeded after a few days by blisters, and perhaps, in cases of persistent lameness, both firing and blistering. Bog spavin is often met with in big, raw-boned, growing colts, and when the animals are well fed and cared for, tends to disappear by the time they reach maturity. See SPAVIN.

Bogue, DAVID, one of the founders of the London Missionary Society, was in 1750 born in Coldingham parish, Berwickshire. He studied at Edinburgh, and was licensed to preach by the Church of Scotland, but went to London to teach in 1771. He afterwards became minister of an Independent chapel at Gosport, and here he also took a tutorship in a seminary for Independent students of theology. This became a great school of missionaries, and out of it grew the scheme for foreign missions realised in the London Missionary Society. Bogue also took an active part in the establishment of the British and Foreign Bible Society and the Religious Tract Society. He was on the point of going as a missionary to India in 1796, when the East India Company refused to sanction the scheme. Bogue died at Brighton, October 25, 1825. He published numerous books, including an *Essay on the Divine Authority of the New Testament*. In conjunction with Dr James Bennet, he wrote a *History of Dissenters* (3 vols. 1809), of great value, though somewhat impaired by partisan prejudices.

Boguslav, a town of Ukraine, 70 miles SSE. of Kieff; pop. 13,000.

Bohemia (Ger. *Böhmen*), formerly one of the kingdoms of Europe, now forms the most westerly part of the Czechoslovak republic, touching Saxony and Prussian Silesia, Moravia, Lower and Upper Austria, and Bavaria. It has an area of 20,000 sq. m., or about two-thirds that of Scotland; pop. (1869) 5,140,544; (1880) 5,560,819; (1910) 6,774,309; (1921) 6,664,932. Of its four hundred cities and towns the most important are Prague (Prahá), the capital of the kingdom and now of the republic, with 676,000 inhabitants; Pilsen (Plzeň), over 88,000; and Budweis (Budejovice), with 44,000. The country is surrounded on all sides by lofty mountain-ranges, the principal of which are the Riesengebirge (part of the Sudetic chain) on the north-east, dividing Bohemia from Silesia, and attaining, in the peak of the Schneekoppe, a height of 5330 feet; on the north-west, the Erzgebirge, attaining a height of more than 4000 feet; on the south-west, the Böhmerwald, reaching 4783 feet. Offsets from these traverse the interior of the country, which has an undulating surface, sloping generally to the north. The country belongs to the upper basin of the Elbe, which rises in the Riesengebirge range; and it is well watered by the affluents of that river. The chief of these are the Moldau, the Eger, Iser, Anpa, Mettau, and Biela.

The climate of Bohemia is generally healthy, but varies greatly in different districts. In the valleys it is mild and pleasant, but raw and cold in the mountainous regions, where the higher peaks are covered with snow during a great portion of the year.

The mountain-chains which rise on all sides of Bohemia consist largely of primitive rocks, principally gneiss, mica-slate, and granite. Basalt, clinkstone, greenstone, and red sandstone are also common, and with the last, diluvial and alluvial deposits are met with, often to a considerable elevation. The extensive Silurian beds near Prague are rich in fossils. The plains belong chiefly to the Middle or Miocene period of the Tertiary formation, with sand, gravel, and marl.

A remnant of volcanic action, of which traces are common, still continues in the eruptions of carbonic acid gas which have established so many mineral springs of deserved repute, at Carlsbad, Eger (Cheb), Marienbad, Teplitz, and throughout the country.

The mineral wealth is varied and extensive, consisting of silver, tin, copper, lead, iron, cobalt, bismuth, antimony, alum, sulphur, graphite, and porcelain clay, with several precious and ornamental stones. Much coal is produced. The swampy plains yield an enormous amount of peat, and a large quantity of asphaltum is also obtained. On the other hand, no salt at all is found.

The soil is generally fertile. More than one-half of the area consists of arable land; nearly one-eighth is laid out in meadows and gardens; pastures form about a twelfth; and forests cover nearly a third. Wheat, rye, barley, and oats are raised. Flax and hops are plentiful, and a great variety of fruit is exported in large quantities. The culture of the vine is confined to the vicinity of the Moldau and the Elbe. Cattle, sheep, goats, and swine are reared extensively in some districts; bees and geese form important items in the resources of the country.

In manufactures Bohemia holds a very high place among Continental countries. It is a great centre of dyeing and calico-printing. The linen manufacture is extensive. The chief seat of the woollen manufacture is Reichenberg and its neighbourhood. Other important industries are the manufacture of paper, ribbons, lace, chemicals, porcelain-ware, and the Turkish fez. The glass-works are celebrated, and very numerous and extensive. Much beet-sugar is made, and there are hundreds of breweries and brandy distilleries throughout the country, mostly on a small scale, although Bohemian beer is sold throughout Europe. The manufacture of iron is considerable. Its position secures Bohemia a large transit-trade. Steamboats ply on the Elbe and Moldau, and a canal crossing into Upper Austria conveys the timber of the Böhmerwald from the latter into the Danube. There are good roads and an excellent system of railways centring in the capital, Prague.

Population, Religion, &c.—The Czechs, a Slavonic race, form the bulk of the people, and constitute some two-thirds of the total population, the other third being German. They dwell chiefly in the centre and east of the country. The German population reside mainly around the borders and in the cities; their influence on industry, trade, and commerce is great in proportion to their numbers. The distinction between Czech and German is very sharply drawn. There are about 400,000 Jews. The Roman Catholic Church has lost much by secessions since the republic was formed. The Roman Catholics are under the supervision of the Archbishop of Prague and the three bishops of Leitmeritz, Königgrätz, and Budweis. Education is much more widely diffused than in any of the other former provinces of Austria. At the head of the educational establishments are the German and Czech universities of Prague.

Bohemian Brethren, a religious society, instituted in Prague about the middle of the 15th century, originally composed of remnants of the Hussites. In 1453 they settled on the borders of Silesia and Moravia. The Thirty Years' War entirely broke up the societies of the Brethren; but afterwards they united again, though persecuted. Their exodus and settlement in 1722 on the estates of Count Zinzendorf (q.v.) in Saxony occasioned the formation of the Herrnhuters. See MORAVIANS.

Bohemond I., eldest son of Robert Guiscard (q.v.), was born about 1056, and during his youth distinguished himself in his father's war against the

Byzantine emperor, Alexius Comnenus (1081-85). After his father's death he was excluded from the throne of Apulia by his brother Roger, and only gained the principality of Tarentum after a long contest. He joined the crusade of 1096 with a large army—most of which he had won over from his brother's service—and took a prominent part in the capture of Antioch (1098). While the other crusaders advanced to storm Jerusalem, Bohemond remained in Antioch, where he established himself as prince, and routed the besieging forces of the sultan. He was afterwards made prisoner by a Turkish emir, and remained two years in captivity. Tancred, meanwhile, looked after his interests in Antioch. Bohemond returned to Europe to collect troops, and after defeating Alexius in several engagements, was acknowledged by that emperor as Prince of Antioch. He died in Apulia (1111). His son assumed the government of Antioch in 1126, and was killed in battle (1130).

Böhme. See BOEHME.

Böhmisch-Brod, or BRODĚSKÝ, a small town, 20 miles E. of Prague by rail, near which the Hussites (q.v.) were defeated in 1434. See PROCOP.

Bohn, HENRY GEORGE, publisher, was born in London, January 4, 1796. His father, a German, was a bookbinder, and latterly a second-hand bookseller, and young Bohn, adopting the latter business, in 1831 started on his own account, amassed many valuable old books, and in 1841 issued his famous 'guinea catalogue,' containing 23,208 articles. Next he tried the 'remainder trade, and in 1846 he began the issue of the series of works with which his name is identified. It is impossible to estimate too highly the services he has rendered to the community by republishing, at a cheap rate, a vast number of the most valuable works in literature, science, philosophy, theology, &c. The whole eventually numbered over 600 volumes. He also edited the *Bibliotheca Parviana*, Lowndes's *Bibliographer's Manual*, &c., and issued translations of Schiller, Goethe, and Humboldt, besides a *Handbook of Proverbs*, and a *Dictionary of English Poetical Quotations*. After retiring from business in 1864, his chief stock, copyrights, and second-hand books, realised about £100,000. The china and art collections, sold both before and after his death, realised £45,000. He died August 22, 1884.

Böhtlingk, OTTO, Sanskrit scholar, was born in 1815 of German ancestry at St Petersburg; from 1835 to 1842 studied oriental languages, especially Sanskrit, at Berlin and Bonn; and, after twenty-six years in his native city, removed in 1868 to Jena, and thence to Leipzig. Among his invaluable works are the first European edition of the Indian grammarian Panini (1839), a Sanskrit chrestomathy (1845; 2d ed. 1877), and a great Sanskrit dictionary (7 vols. 1855-75). He died in 1904.

Bohun, THE FAMILY OF, was founded by the Norman Humphrey de Bohun, and in 1199 the head of the house became Earl of Hereford. The then Earl of Hereford was taken prisoner at Bannockburn, and a kinsman was slain in single combat by Bruce. In 1380 the heiress of the earldoms of Hereford, Essex, and Northampton, married Henry Bolingbroke (Henry IV.).

Boiardo, MATTEO MARIA, Count of Scandiano, one of the greater Italian poets, was born in 1434 at Scandiano, a village situated at the foot of the Lombard Apennines. He studied at the university of Ferrara, and in 1462 married the daughter of the Count of Norellara. He lived principally at the court of Ferrara on terms of intimate friendship with Duke Borsó and Duke Ercole, by the latter of whom he was employed on important

diplomatic missions, and appointed in 1481 governor of Modena, and in 1487 governor of Reggio. As an administrator he was distinguished for his clemency, and is said to have held that no crime should be visited with capital punishment. He died at Reggio in 1494. Boiardo has been called the 'Flower of Chivalry.' His fame rests on the *Orlando Innamorato* (1486), a long narrative poem in which the romances of the Carolingian cycle are recast into *Ottava rima*. Full of rich and graceful fancy, this is the only work in which the spirit of chivalry is found in union with the spirit of the Renaissance. The chief characters, the Paladins of Charlemagne, are led in a maze of adventure from Paris to Spain, Hungary, Africa, and the far East; Orlando, whose love for the eastern princess Angelica is the central subject, being none other than the hero of the old *Chanson de Roland*. Ariosto adopted Boiardo's characters and magic machinery, and brought his narrative to a close in the *Orlando Furioso*, by which the fame of the earlier poem has been unfairly obscured. After going through sixteen editions before 1545, Boiardo's work became almost forgotten, its vigorous but rough and provincial style being uncongenial to the Florentine taste. Boiardo's other works comprise various Latin eclogues, a versification of Lucian's *Timon*, translations of Herodotus, the *Ass* of Lucian, and the *Golden Ass* of Apuleius, and a series of sonnets and *Canzoni* (Reggio, 1499). The best edition of Boiardo is by Panizzi (9 vols. Lond. 1830). See also Symonds's *Renaissance in Italy*.

Boieldieu, ADRIEN FRANÇOIS, an eminent French composer, was born at Rouen in 1775. His talent for music was early developed. At the age of eighteen he brought out a one-act opera in his native town, and two years afterwards he repaired to Paris, where he produced many successful compositions. When the Conservatoire de Musique was established, Boieldieu was elected a professor. The *Caliphé de Bagdad* (1799) was his first brilliant success. His unhappy marriage with the celebrated dancer, Clotilde Mafieury, induced him to accept an invitation to St Petersburg, where from 1803 to 1810 he filled the post of imperial *maître de chapelle*, wrote the music to Racine's *Athalie*, and produced several operas. Returning to Paris, he brought out *Jean de Paris* (1812), *La Dame Blanche* (1825), his masterpiece, and other popular works. His strength lies in bright and graceful melody, light but tasteful instrumentation, and pure harmony. He has been called 'the French Mozart.' He was elected an academicien in 1817, and on his death, 8th October 1834, the nation honoured him with a public funeral. His native city claimed his heart, and in 1875 erected a monument to him. The government further marked its sense of his merit by granting a pension to his son Adrien (1816-83), who himself composed several operas. See Pougin, *Boieldieu, sa Vie, ses Œuvres* (1875).

Boii, a powerful Celtic people who dwelt originally in Transalpine Gaul, part of whom settled in the modern Bohemia, and bequeathed their name to that country.

Boil (Old Eng. *bȳl*, Middle Eng. *bile*; akin to prov. Eng. and Scots *beal*, 'to suppurate;') its present spelling having arisen through confusion with the verb *boil*, which is from the French) is a hard painful swelling of the skin. It usually begins as a small hard point of a dusky red colour, which is hot, painful, and throbbing. This point extends, and these symptoms increase in severity till sooner or later, when the boil ceases to enlarge, it is of a conical form, with a broad firm base, and on the apex a whitish blister, which contains a little

matter; this opens, and after a few days more there is discharged the *core*, a little pellet of dead cellular tissue, and the small cavity left heals rapidly, leaving a white depressed scar. Sometimes boils subside without any breach in the skin, or any discharge. These are known as *blind* boils, and are generally less conical in shape, less painful, and slower in their progress than the common form. Boils rarely occur singly: very often the subjects of them suffer from successive crops during a period of some weeks or months. They may affect any part of the skin, except the palms of the hands and soles of the feet.

Boils are probably always caused by some abnormal condition of the blood or the nutrition of the body, though they often occur in people who appear to be in good health. They are most common in spring; are rare in young children, most frequent in older children and young adults. Any sudden change in diet and daily habits is very apt to cause them; thus persons undergoing a course of hydropathic treatment, or training for races, and country girls going into town as domestic servants, are very apt to suffer. They often occur also during recovery from exhausting diseases. 'In many cases they must be looked upon as salutary. After an outbreak of boils, the health often gradually improves' (Erichsen).

The best application to a boil in the early stages is collodion, frequently repeated, which often prevents its further development, or a square inch of carbolic acid or mercury plaster, with a small hole in the centre, may be applied over the boil. Later, when the pain is severe, the application of small hot poultices will give relief and hasten the progress of the case. Incision is sometimes advisable if the patient's suffering is great. The constitutional condition must always be attended to, and any error in diet or habits corrected. Aperient medicines are generally useful, with, in enfeebled conditions, tonics. Sulphide of calcium, in doses of a tenth to a quarter of a grain, and yeast in tablespoonfuls, help to prevent the formation of new boils.

Boileau, NICOLAS, was born at Paris, where his father was a registrar in one of the law-courts, on the 1st November 1636. He was educated at Beauvais, and received both a legal and a theological training. In his twenty-first year, however, he inherited a competence, and decided to follow a life of purely literary activity. In his youth he appears to have been most generally known by the surname Despréaux, which he had taken in accordance with a practice of the time. He published his satirical *Adieux d'un Poète à la Ville de Paris* in 1660, and in 1663 we find him united with Molière, La Fontaine, and Racine, in the famous 'society of four.' In 1666 he published a collection of satires from which the royal privilege was for a time withdrawn, through the influence of Chapelain, one of the writers whom he had gibbeted. Boileau, however, soon gained the favour of the king, who awarded him various pensions, and in 1677 appointed him, along with Racine, to the post of royal historiographer. *L'Art Poétique*, which contains the exposition of his literary creed, and which was imitated by Pope in the *Essay on Criticism*, was published in 1674, along with four cantos of the *Lutrin*, a clever serio-comic description of an ecclesiastical squabble over a reading-desk. Two cantos, concluding the poem, appeared in 1681. Between 1669 and 1677 Boileau published nine epistles, written, like his satires, on the Horatian model. To celebrate the capture of Namur in 1692, he composed an ode which remains a glaring example of servile flattery and bad verse. This deplorable production was admirably burlesqued by Prior. In his last years Boileau retired

to Auteuil, where he died on 13th March 1711. His works include several critical dissertations in prose, a collection of epigrams, a translation of Longinus *On the Sublime*, a *Dialogue des Héros de Roman*, and a series of letters, a number of which are addressed to Racine, extending from 1672 to 1710. He appears to have been of a jealous, arrogant nature, but not without generosity. Though he secretly preferred Corneille to Racine, he did his best to exalt the younger at the expense of the elder dramatist. Nevertheless, when Corneille's pension was stopped, he is said to have made a courageous protest to the king against 'so barbarous a spoliation.' His verse has wit and vigour, but he never rises to the level of the great satirists. His influence as a critic has been profound. The 16th century had flooded French literature with new words and new ideas. The riches which it had imported and developed required to be sifted, refined, and reduced to order. This task, which had been begun by Malherbe, was carried out with drastic energy by Boileau. He set up good sense, sobriety, elegance and dignity of style as the cardinal literary virtues. He discountenanced the conceits of the salon coteries, and the grossness and grotesqueness of the earlier writers. Through his influence more than any other man's, French prose became almost identical with clear, precise, and polished composition. But for more than a hundred years, while his authority was at its height, there was a distinct falling-off in poetry. Verse was robbed of fire and melody and the power of vague suggestion. The drama was divorced from real life, and restricted to certain prescribed situations and conventional characters. Boileau led Frenchmen to look with ignorant contempt on the nation's early literature. While he refined he impoverished the vocabulary. The language lost its old pith, colour, and flexibility, and became for a time incapable of reflecting vivid passion or complex character. Boileau's immense influence was thus both beneficial and hurtful to French letters. For more than a hundred years he was accepted by his countrymen as the infallible 'lawgiver of Parnassus;' and inspiration revived only with the Romantic school.

See editions by Fournier (1873), Gidel (1870-73), and Filon (1908); monographs on him by Lanson (1892) and Morillot (1892); Faguet, *Le XVII^e Siècle* (1887).

Boiler, the name given to a vessel in which steam is generated. The essentials for a boiler are a closed vessel to contain the water and the steam formed by its evaporation, strong enough to resist the maximum pressure of the steam which the boiler is designed to supply, and a furnace or furnaces, external or internal, for the combustion of the fuel, which may be solid, liquid, or gaseous.

When water is boiled in an open vessel at sea-level the temperature of the water and the steam generated from it remain at or near 100° C., and the tension or pressure of the steam is exactly equal to that of the atmosphere surrounding it, namely, under ordinary conditions, 14·7 lb. per square inch. In a closed vessel, on the other hand, the temperature and pressure to which we can raise the steam are limited only by the strength of the containing vessel against bursting.

Boilers may be divided into two classes, the one in which the vessel holds a comparatively large quantity of water, and the other in which the water is chiefly contained in a number of small tubes; the latter are generally called 'water-tube' boilers. In the first class the outer shell of the boiler is entirely or mainly cylindrical, this being the most economical shape to resist the internal pressure of the steam; the furnace is then usually internal, and the furnace plates provide the most efficient

portion of the heating surfaces through which the heat of combustion passes to the water within; such boilers may be fixed in a brickwork setting or be quite independent of any setting.

Lancashire and Cornish Boilers.—These are horizontal boilers similar in construction, but the former has two internal furnaces, the latter only one; they are both cylindrical in shape, with flat ends stayed to the cylindrical shell and to one another. The furnace is cylindrical, generally extending right through the shell from one end to the other. In the Lancashire type the shell may be 25 to 30 feet in length, and from 6 feet 6 inches to 8 feet in diameter; the furnace-flues are usually about 33 to 36 inches in diameter, and are made in short lengths united to one another by various types of stiffening-rings to assist against collapse; these boilers, according to the thickness of the shell and flue-plating, generate steam at pressures from 60 to 200 lb. per square inch. In one special type, the 'Galloway,' the two furnaces only extend for about 10 feet, then they unite into a single large flue provided with cross-tubes, which extends from the union to the back end plate of the boiler. The Cornish boiler is generally used where less steam and a lower steam pressure is required; it is smaller in overall dimensions than the Lancashire type, and has only one furnace, which may, as is the case with the two furnaces of the Lancashire, have conical cross-tubes in the portion behind the furnace-bridge. In both classes the brickwork

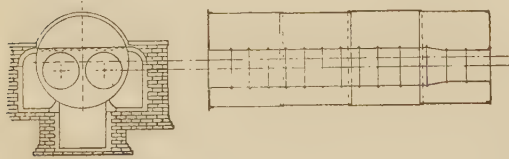


Fig. 1.—Lancashire Boiler.

setting provides one external flue beneath the centre of the boiler, and two side external flues. Fig. 1 shows a cross-section through a Lancashire boiler and its brickwork setting.

For small installations, as, for example, in steam cranes, vertical cylindrical boilers are largely used. In its simplest form the external shell is a vertical cylinder closed at the top by a crown-plate; the fire-box is also a vertical cylinder, but slightly tapered from the bottom to the top; it is united to the outer shell at the base by the foundation-ring; the top of the fire-box is closed by a crown-plate; the internal smoke-stack passes up through the steam-space and through the crown-plate of the shell. To increase the heating-surface, the fire-box is often fitted with cross water-tubes about 9 inches in diameter; in other types of vertical boilers smaller water-tubes are employed, and some have tubes through which the furnace gases pass from the fire-box on their way to the smoke-box. Fig. 2 shows an example of this class of boiler.

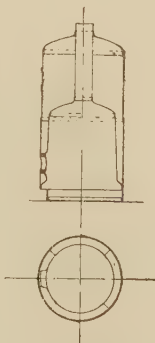


Fig. 2.
Vertical Boiler.

Marine or Scotch Boiler.—This is of the cylindrical multitubular type, and may be single or double ended; in the former the furnaces are at one end, and vary in number from one to four according to the diameter of the shell; each furnace may have its own combustion-chamber, or with four furnaces the two middle furnaces may have a common combustion-chamber, and occasionally one chamber

serves each pair of furnaces on either side of the centre line. In the double-ended type there are furnaces at each end, and usually one combustion-chamber serves for a pair of furnaces, one at each end. From the combustion-chamber the hot gases of combustion pass back to the front of the boiler through a great number of small tubes packed close together, 3 to 3½ inches in diameter; some of these tubes act as stay tubes; the space in front of the tube openings in the front of the shell is closed in, forming the smoke-box, which communicates with the funnel. The staying in these boilers is some-

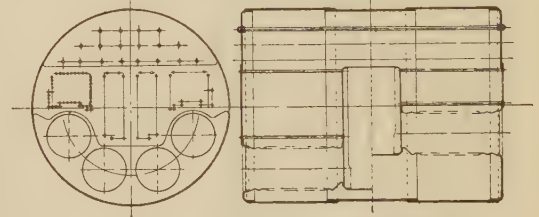


Fig. 3.—Double-ended Marine Boiler.

what elaborate; above the combustion-chamber level the end plates are stayed by longitudinal round bar stays, the combustion-chambers are stayed to one another and to the outer shell by short screwed steel stays, the flat tops of the combustion-chambers have girder stays, and the tube-plates tube stays. These boilers are constructed up to 17 feet in external diameter, and up to a length of about 12 feet in single-ended, and to a length of 20 feet in the case of double-ended boilers. The usual working steam-pressure varies from 150 to 200 lb. per square inch, though in a few cases still higher pressures have been adopted. They may be worked with natural or forced draught; in the latter case the tubes are usually only 2½ inches in diameter. This type of boiler, in the form known as dry-back boilers, has been used for land purposes, in which case the tubes pass from the combustion-chamber to the back of the boiler. Fig. 3 shows a cross-section of a double-ended boiler.

Locomotive Boilers.—In this type the boiler is made up of a cylindrical barrel, which is joined at its back end to an almost rectangular in section portion inside which is the fire-box, which is itself almost rectangular in cross-section; from the fire-box the combustion gases pass through a series of tubes, 1½ to 2½ inches in diameter, extending through the barrel from the fire-box to the smoke-box at the front end, whence the gases pass up the funnel. In these boilers the staying is similar in general arrangement to that of the marine cylindrical boiler, screw stays, longitudinal stays, and girder stays being all employed. These boilers work up to a pressure of 200 lb. per square inch, and have a large ratio of heating surface to grate area, to allow a rapid combustion of the fuel upon the grate.

Water-tube Boilers are now extensively used both for land and marine purposes; they are quicker and more economical than cylindrical boilers in raising steam, give greater facilities for repair, and have other advantages. There are a number of types used for land purposes; the types most employed in this country are the Babcock and Wilcox, and the Stirling. For marine purposes the earliest and best known were the Belleville and the Niclausse; now those more commonly used are the Thornycroft, the Babcock-Wilcox, and the Yarrow. All these types differ much in their general arrangements and details, but the general principle is more or less similar in all. There is a series of tubes of small diameter,

connected either directly or through the medium of headers with the steam and water drum at the top of the boiler, and with another drum at the bottom. These tubes are filled with water and the flames pass round them. As the water is heated, it rises into the upper cylindrical drum, where the steam is separated, the water passing down again to the lower drum by another set of tubes, and thus a quick and constant circulation is continuously kept up. Some types have one upper receiver only, others as many as four; some have straight tubes, others have bent tubes.

A great many boilers are now fitted with special superheating arrangements, by means of which the temperature is raised considerably above the saturation temperature corresponding to the steam pressure. In ordinary boilers of all types the plating and staying are now invariably made of mild steel. Where small tubes are employed, they are generally lap-welded wrought-iron, but in the case of water-tube boilers, seamless steel tubes are employed. In locomotive boilers the fire-box plates are usually copper, though in the United States they are also made of steel. Where copper is used for the fire-box, the fire-box side stays are copper or bronze. The tubes of locomotive boilers are commonly made of brass; occasionally copper tubes are used.

Boiler Fittings.—Every boiler requires, in order to render it complete and workable, a number of *fittings or mountings*, of which the following are the principal: a gauge glass to show the level of the water inside the boiler, and gauge cocks for the same purpose (it is essential that the water-level should be kept well above the heating surfaces); a gauge to show the pressure of the steam; a valve for admitting the feed water; a blow-off cock at the bottom of the boiler for emptying it or for blowing out sediment; a stop-valve for regulating the flow of the steam from the boiler to the steam pipe; one or more safety-valves, weighted so that when the pressure of the steam in the boiler reaches a desired amount the safety-valves open and allow steam to blow off into the air; one opening, closed by doors, by which a man can get into the boiler for cleaning or repair purposes, and frequently smaller openings similarly closed to enable tubes to be cleaned, &c.

In order to maintain an adequate flow of air to the furnaces, so that proper combustion may be secured, land boilers are provided with a brick or sheet-steel chimney of considerable height, the products of combustion passing from the flues to this chimney. In locomotive boilers a powerful draught through the furnace is obtained by the use of the exhaust steam from the engine cylinders, which is discharged through a contracted nozzle opening at the base of the funnel. In marine and many land boilers forced draught is employed, which enables a greater rate of combustion to be maintained in the furnace; jets of steam or fans may be used for this purpose.

Losses by radiation are prevented by covering all parts of the boiler exposed to the atmosphere with some form of non-conducting composition; economy and regularity in steam generation is much improved by the use of automatic stoking machinery, now generally fitted to all large land boilers, though so far such stokers have not been employed with marine boilers.

When the feed water is 'hard,' it is desirable to employ some form of water softening to reduce the degree of hardness of the water before it is fed into the boiler; this much reduces the tendency to scaling on the inside surfaces of the plates and tubes. When the condensed steam from the engines is returned to the boiler, some form of feed filters should be fitted for the removal from the feed water of as much as possible of the oily matter which is

liable to be carried away by the exhaust steam from the engine cylinders. All boilers should be opened up, examined, and thoroughly cleaned at regular intervals.

The efficiency of a boiler is determined by tests, the object of which is to ascertain accurately the proportion of the total heat given out by perfect combustion of the fuel which is utilised in the formation of dry saturated steam, what proportion is lost by imperfect combustion and radiation, and what proportion is lost in the heat carried away up the chimney by the products of combustion and the surplus air. An efficiency of 80 per cent. is rarely reached; 75 per cent. may be taken as that of a good boiler, and in small vertical boilers it more often lies between 50 and 60 per cent. A common method of expressing the performance of a boiler is to give the number of pounds of water which it will evaporate into steam from and at 100° C. per pound of coal fired; in small boilers this may be as low as 6 or 7 lb., and in a boiler of high efficiency it may be as high as 12 lb.

The rate of combustion on the grate varies widely with the type of the boiler and the nature of the draught; with natural draught it may be as high as 18 to 25 lb. of coal per square foot of grate per hour; much higher rates can be obtained with water-tube boilers when forced draught is used, and still higher in the case of locomotive boilers.

See **BOILING, GAS AND GASES, INJECTOR, SAFETY-VALVE, STEAM, STEAM-ENGINE**; also Bauer and Robertson, *Marine Engines and Boilers*; John Gray, *Practical Design of Marine Boilers*; C. F. Wade, *Efficient Boiler Management*; Bryan Donkin, *Heat Efficiency of Steam Boilers*; Robert H. Smith, *Boilers, Economisers, and Superheaters*.

Boiling as a punishment was in use in England and elsewhere for coiners and poisoners. Several persons were boiled (or immersed in boiling water) at Smithfield under an act of 1531, repealed in 1547, for poisoning, usually for poisoning their employers.

Boiling, Boiling-point. When heat is applied to a vessel containing a liquid (say water) at ordinary temperatures, the temperature of the liquid gradually rises. Vapour may be seen rising from its surface; and, after a time, bubbles of vapour form in the interior and move upwards, but disappear before they reach the surface. The disappearance of the bubbles is caused by the condensation of the contained vapour, and is accompanied by the so-called *singing* of the water. This noise is produced by the falling in of the walls of the bubbles when the vapour is condensed, and increases in intensity as the number of the bubbles increases. If heat be still applied, the temperature rises to such an amount that the bubbles no longer condense, but pass freely to the surface of the liquid. The liquid is then said to *boil*. When this occurs the temperature remains constant on the whole until all the water is boiled off. This temperature is called the *boiling-point*. It may be defined as the temperature at which vapour comes off *freely* from the surface of the liquid. Different liquids boil at different temperatures; and, for each liquid, this temperature increases with increase of the external pressure. The following numbers, extracted from Regnault's tables, show how the boiling-point of water is affected by pressure:

Temperature Centigrade.											
0°	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°	
Pressure in Atmospheres.											
0.006	0.012	0.023	0.042	0.072	0.121	0.196	0.306	0.466	0.691	1.000	

Thus, if the pressure be 0.023 atmospheres, water will boil at 20° C. or 68° F. And if water at a temperature much below its ordinary boiling-point be placed under the receiver of an air-pump and the pressure be reduced, it may be made to boil.

It will give off vapour under these conditions until the pressure rises to that corresponding (as in the table above) to the given temperature. When this condition of equilibrium is reached, the vapour is said to be *saturated*. Thus we obtain another definition—the boiling-point of a liquid is the temperature at which its saturated vapour has a pressure equal to that to which its surface is subjected.

Abnormal boiling-points may be obtained artificially. Thus, if water be carefully heated in a very smooth and clean glass vessel, its temperature may be raised considerably above the ordinary point before it boils. But in this case the boiling takes place explosively when it does begin.

Since the atmospheric pressure depends upon the height above the earth's surface, the boiling-point of water varies with the height. This furnishes the principle of the hypsometric thermometer (see BAROMETER, and HEIGHTS, MEASUREMENT OF). Under the surface of a liquid the pressure increases with the depth. Hence the boiling-point increases with the depth. This explains the phenomena of the Geysers (q.v.). See also PAPIN'S DIGESTER, and SPHEROIDAL STATE OF LIQUIDS.

Boiling, in Cookery. One important preliminary rule in boiling rests on the fact explained in the preceding article, that water cannot be heated in an open vessel, or in one with the ordinary fitting lid of a cooking utensil, to a higher point than 212°. When a vessel, then, has once begun to boil, a stronger fire than is just sufficient to keep it boiling will only evaporate, or waste, the water in steam, but will not cook the food any faster. To boil a joint of meat successfully, it is necessary to place it in water already heated to the boiling-point, in order that the albuminous matters of the skin, &c. may be coagulated as speedily as possible. The coagulated albumen forms an impenetrable coating or varnish, as it were, thus preventing the soaking out of the nutritious juices of the meat. After this has been accomplished, the pot should be withdrawn from the fire, so as to allow the water only to simmer. The cooking goes on through the agency of the natural moisture of the flesh. Converted into vapour by the heat, a kind of steaming takes place within the piece of meat; it is, when skilfully done, cooked by its own steam.

The meat should be trimmed, washed, and dried before it is placed in the water. As it simmers, the water should be kept well skimmed, but with due remembrance of the fact that raising the lid of the vessel lowers the temperature of the water; and the preservation of an equal degree of heat throughout the operation is of the greatest importance. For fresh meat, 20 minutes is the allowance for each pound. The weather must also be considered: in frosty weather, or with very thick joints, extra 20 minutes should be given. Mutton loses in boiling, in 1 lb., 3½ oz.; beef, in 1 lb., 4 oz. Meat that has been salted and dried has its outer coat already sealed up; it requires, therefore, to be thoroughly washed, soaked for 2 hours in cold water, dried, and put to boil in cold water, gradually brought to the boiling-point, and kept simmering for a time proportioned to the size of the piece. Hams and tongues to be eaten cold, should be allowed to cool in the water in which they have been boiled. The following is a time-table for the cooking of these meats, reckoning from the time the water boils: A ham of 16 lb. takes 5 hours; a tongue of 16 lb., 2 to 4 hours; a pig's face of 16 lb., 2 hours; a piece of bacon of 4 lb., 2 hours.

Before boiling poultry or fish, it is advisable to rub the outside skin with a cut lemon. This insures a snowy-white appearance in the cooked food. Fish should be placed in cold water, in which a tablespoonful of salt and one of vinegar is mixed;

should be gradually brought to the boiling-point, and simmered carefully, lest the outer part should crack before the thick part is done. If on drawing up the fish-plate, a thin knife will easily divide the flesh from the bone in the thick parts, and if the eyes contract, and become like balls, the fish is sufficiently cooked. Drain by laying the plate across the kettle covered with the lid, and dish perfectly dry on the strainer, which should be covered with a napkin.

Vegetables require generally to be well washed, and placed in boiling water, in which is mixed a large spoonful of salt. To preserve the green colour they are best boiled in a pan without a cover. When they sink they are done. Green vegetables should be well picked, soaked in salt and water, drained and boiled in plenty of water, in a vessel without a lid. Cabbage requires two waters; spinach, very little, as it is full of moisture. Pease and beans should not soak, but be merely rinsed in a colander. Winter potatoes should soak for an hour or more; whether they should be placed in cold or boiling water depends on the description. A piece of soda the size of a small marble assists the boiling of pease and cabbage, if the water is very hard.

Frying is practically boiling in fat or oil, and when properly carried out, with a pan full of oil, is the preferable way of cooking fish and some vegetables.

Bois d'Arc (sometimes corrupted into BODOCK), also Bow-wood, or Osage-orange (*Machura aurantiaca*), a tree belonging to the dicotyledonous order Moraceæ, is a native of the Southern United States. Its large beautiful orange-like fruits are scarcely eatable, but its spines make it useful as a hedge plant. Its wood is strong, and hard, and elastic, and hence was used by the Indians in the manufacture of their bows.

Bois-de-Boulogne. See BOULOGNE.

Boise (formerly *Boisé City*), capital of the state of Idaho, U.S., near the Boise River, 520 miles N.E. of San Francisco. The public buildings include a United States assay-office, gold being the principal article of export. A branch railway, 20 miles long, connects the city with the Oregon Short Line Railroad. Pop. 20,000.

Boisgobey, FORTUNÉ DU, a French novelist, was born in 1824 at Granville in Normandy, and died 26th February 1891. After several campaigns in Algeria as army-paymaster, he made his first appeal to the public in 1863, with a story in the pages of the *Petit Journal*. It was followed in quick succession by a crowd of sensational stories which soon gained a certain popularity even in England, spite of the exceptionally poor quality of the current translations. A close follower of Gaboriau, he has all his master's vigour and ingenuity, but lacks that sense of dramatic fitness and respect for verisimilitude which saved the original from the impossible absurdities of the imitations. But lovers of 'police-novels' are not exacting in literary workmanship, and Du Boisgobey's stories are at least always readable. Among the best are *L'Homme sans Nom* (1872), *Le Forçat Colonel* (1872), *L'As de Cœur* (1875), *Les Mystères de Nouveau Paris* (1876), *Le Crime de l'Opéra* (1880), and *Le Secret de Berthe* (1884). Some twenty of them have been translated.

Bois-le-Duc (Dutch, *'s Hertogenbosch*, 'Duke's Forest'), a city of the Netherlands, capital of North Brabant, is 28 miles SSE. of Utrecht by rail. It is a clean, well-built town, about 5 miles in circumference, intersected by canals, and was strongly fortified till 1876. Bois-le-Duc is the seat of a Catholic archbishop, and has a very fine cathedral (1312-1498), a town-hall, college, arsenal,

an academy of arts, a grammar-school, &c. Iron-founding, book-printing, the making of beer, spirits, leather, woollens, cigars, jewellery, linen-thread, ribbons, and cutlery, are the principal industries. Bois-le-Duc was founded in 1184 by Godfrey III., Duke of Brabant, in a wood; hence its name. His son Henry strengthened the town with walls. The town was ineffectually besieged in 1601 and 1603, but surrendered to the Dutch in 1629. In 1794 it was taken by the French, and in 1814 retaken by the Prussians. Pop. 40,000.

Boisserée, SULPIZ, was born at Cologne in 1783. Inspired with the idea of collecting the scattered specimens of early German art, he and his brother Melchior gathered together two hundred pictures in a gallery in Stuttgart. In 1827 the collection was sold to the king of Bavaria, and in 1836 transferred to the Munich *Pinakothek*. Sulpiz, who died in 1854, was author of *Geschichte des Doms von Köln* (1823-32) and other important works. See his Life by his widow (1862).

Boissonade, JEAN FRANÇOIS, Hellenist, born at Paris in 1774, became in 1809 titular, and three years later actual professor of Greek in the university of Paris; in 1813 member of the Academy of Inscriptions; and in 1828 professor of Greek Literature in the College of France. His more important works are *Philostrati Heroica* (1806); *Marini Vita Procli* (1814), *Tiberius Rhetor de Figuris* (1815), *Sylloge Poetarum Græcorum* (1823-26), *Babrii Fabulæ* (1844). He died at Passy, 8th September 1859.

Boissy d'Anglas, FRANÇOIS ANTOINE, COUNT, French statesman, born at St Jean Chambre, in Ardèche, in 1756, was for some time major-domo to the Count of Provence (Louis XVIII.), and a member of the States-general. During the Reign of Terror, fear of the 'Mountain' kept him quiet; but, yielding to the solicitations of Tallien and Barrère, he joined the conspiracy against Robespierre. Two months after the execution of the tyrant, he was elected secretary of the Convention; and shortly after, a member of the Committee of Public Safety, in which capacity he displayed remarkable talent and discretion. As director of the supply of provisions for Paris, he was exposed more than once to popular hatred, but firmness and presence of mind preserved him. He was afterwards president of the Council of Five Hundred; was called into the Senate by Napoleon; and made a peer by Louis XVIII. Through all the changes of the times he maintained the principles with which he had commenced his career. He died in Paris, October 20, 1826. His chief writings are: *Recherches sur la Vie, les Écrits, et les Opinions de Malesherbes* (1819), and *Études Littéraires et Poétiques d'un Vieillard* (1826).

Boito, ARRIGO (1842-1918), Italian composer and poet, was born at Padua, and studied at the Milan Conservatorium. His first important work, the opera *Mefistofele*, produced without success in 1868, has steadily grown in popularity. It betrays the influence of Wagner. Other operas, *Ero e Leandro*, *Nerone*, *Orestia*, were not produced. He wrote his own and other libretti, and several songs, lyrical dramas, and novels.

Boivin, MARIE, a French midwife, born in 1773, became a nun; but after the destruction of the nunnery at the Revolution, she devoted herself to midwifery. So distinguished was she as superintendent of the Maternité at Paris, that the king of Prussia conferred an order on her, and Marburg University the degree of M.D. She died in 1841.

Bojador, CAPE, a headland on the west coast of Africa, in 26° 7' N. lat., 14° 29' W. long. The Portuguese doubled this cape in 1432.

Bojano, an ancient Italian town with a cathedral, on the Biferno, 13 miles SW. of Campobasso. Pop. 6000.

Bojer, JOHAN, Norwegian novelist, born at Trondjem in 1873, was influenced by Zola and Knut Hamsun. Of his realistic novels of peasant life, *The Power of a Lie* and *The Great Hunger* have been translated.

Bokhara, an independent state of Central Asia, in alliance with Russia (1921), is bounded to the north by Samarkand, Syr Daria, and Ferghana, east by Ferghana (the Pamir), west by Khiva and Transcaspia, south by Afghanistan. The population is estimated (Islam forbidding a census) at from 1,250,000 to 3,000,000; the area is about 80,000 sq. m.

Central and Eastern Bokhara are mountainous, with great glaciers and peaks exceeding 20,000 feet; Western Bokhara (i.e. W. of 66° E.), forming nearly one-third of the country, consists of steppe and desert, but contains the fertile and highly populated oases of the Zarafshan. The Hissar and Zarafshan ranges (attaining 18,000 feet) separate Bokhara from Samarkand; the Amu-Daria (Oxus) and its tributary the Panj for over 700 miles divide Bokhara from Afghanistan. Bokhara's eastern extremity includes the lofty and sparsely inhabited regions of West Pamir, Vakhán, Shugnan, and Roshan. North of Badakshan (q.v.) are the mountainous provinces of Darwaz and Karategin (q.v.), Peter the Great range (nearly 22,000 feet), and the Surkháb or Vaksh, which, flowing into Bokhara between the Alai and Transalai Mountains, runs SW. to unite with the Panj in the Amu-Daria. The middle section, in which lies Hissar (q.v.), has high plateaus and cultivated valleys—the Kafir-nihan and Surkhan, which join the Amu-Daria, and the Kashka-Daria, with the populous towns of Karshi (q.v.), Kitab, Shar (Chaar), &c. In the west is Bokhara proper, fertilised by the lower Zarafshan (which, like the Kashka-Daria, is smothered in sand before reaching the Amu-Daria) and developed by the Transcaspian Railway, laid (1886-88) across the desert from Charjui (q.v.), on the Amu-Daria, to Bokhara City, and thence up the Zarafshan to Samarkand. The Zarafshan ('Strewer of Gold'; the *Polytimetus* of the ancients) rises in a glacier to the N. of Karategin at an altitude of about 9000 feet, and flows through Samarkand province between the Turkestan and Zarafshan ranges (which continue the Alai Mountains westward). At Samarkand city, midway in its course of 400 miles, it is only 2400 feet above sea-level. Below Katta-Kurgan it enters Bokharan territory, and flows through level country past Kerminé and Bokhara city to Karakul and Dengiz-Kul, salt lakes, 15 to 20 miles from the Amu-Daria. From about 66° E., between Kelif and Kerki, the Amu-Daria flows north-westwards through Bokharan deserts towards Khiva and the Aral Sea. West of the Zarafshan is likewise desert.

The climate is healthy, but subject to great extremes of heat and cold. The cultivated parts (chiefly Zarafshan, Kashka-Daria, Hissar, and Karategin valleys) depend not on the spring rains, but on irrigation, facilitated by the melting of highland snow and glaciers, and on fertile loess from the disintegrating mountains, carried by winds and deposited by rivers. Sand-storms and drifting sands are frequent, and the problem of desiccation engages men of science and officials. Bokhara's mineral resources have been little studied, and transport difficulties militate against exploitation. The sands of some rivers yield a little gold. Salt deposits are numerous. The products of the soil include cotton and rice, wheat, barley, durra, lucerne, sesame, millet, hemp, tobacco, melons, pumpkins, fruit, and vegetables.

Sheep and goats form a great source of wealth; the skins of Karakul lambs are known as astrakhan. Camels are numerous and valuable, the horses and yak-oxen are celebrated for their endurance, and the breed of asses is excellent. Myriads of silkworms are fed on the mulberry-trees that clothe the banks of every stream. The manufactures include silk-stuffs, cottons, jewellery, cutlery, firearms, carpets, leather-work, brass-ware. Its geographical position secures Bokhara a great transit-trade.

Bokhara, which in ancient times formed part of Sogdiana (q.v.), was conquered in the beginning of the 8th century by the Arabs, who were dispossessed of it by Genghis Khan. It fell into the hands of Timur, and about 1500 was taken by the Uzbegs, its present masters. During the 18th century, thanks to its khans, vice, and fanaticism, Bokhara lost its political pre-eminence among the khanates of Turkestan. The canals, which alone gave fertility to the country, were neglected; large areas were again overspread by the desert; and the population diminished. With the accession of the Khan Nasrullah (1826), a barbarous and incapable tyrant, the country became an object of rivalry to Britain and Russia, who sent envoys to cultivate his friendship (see BURNES); but he and his successor, Mozaffar-ed-din, treated both with equal insolence and contempt. After the capture of Tashkand by the Russians in 1865 (see TURKESTAN), a religious war was preached against the Russians, and the khan was compelled to oppose them. He was defeated at the battle of Irdjar, May 20, 1866; and in May 1868 Samarkand (q.v.), one of the most important cities of Bokhara, was taken. The Russians' command of the upper course of the Zarafshan, which fertilises the capital and country, placed the khan entirely under the power of Russia. In July 1868 Samarkand was ceded to the tsar, and Russians were granted trade privileges (extended in 1873) in Bokhara. The treaty caused great dissatisfaction to the fanatic Mussulmans of Bokhara, who rose in rebellion. The Russians aided the khan at his request; and in October the rebels were defeated near Karshi. The rebel leader, the khan's son and heir, sought refuge in Afghanistan, with which hostilities nearly followed. During the invasion of Khiva (q.v.) in 1873 the khan efficiently assisted the Russians. After the loss of Samarkand the khan's power was extended and consolidated to the east and south. Mozaffar-ed-din in 1885 was succeeded by Abd-ul-Ahad, his younger son, whose mental and physical weakness rendered him anxious to secure the protection of Russia. A Russian political agent was appointed in 1888, and by degrees, with the help of the Transcaspian Railway, the country was practically absorbed into Russian Turkestan. In 1892 Russia extended its customs to the Bokharan-Afghan boundary. The Russians interfered little with the internal administration, the khan or emir enjoying despotic powers, and, like the begs who governed the semi-independent provinces, taxing his subjects to the utmost. The army numbered about 11,000. Owing to excessive impositions and sectarian animosities, sanguinary rioting broke out in Bokhara after the accession of Abd-ul-Ahad's son, Sayid-Mir-Alim (January 1911), but it was suppressed by Russian troops. A 'Young Bokharan' revolutionary movement and Russian invasion occurred in 1920. The khan fled to Afghanistan, and the Soviet system was set up.

See TURKESTAN; Vambéry, *History of Bokhara* (1873); Curzon, *The Pamirs and the Source of the Oxus* (1897); Olusein, *The Emir of Bokhara and his Country* (1911).

BOKHARA, the capital, is situated on a plain a few miles from the Zarafshan, in the midst of trees and gardens. It is between 8 and 9 miles in circum-

ference, and surrounded by embattled mud walls about 24 feet high, pierced by eleven gates. The houses, which are small and ill-lighted, are built of sun-burned bricks on a wooden framework; and the roofs of all are flat. The streets are ill-paved, crooked, and very narrow. The principal square is called Rigistan; here the British emissaries, Stoddart and Conolly, were executed in 1842. The old citadel and palace (the 'Ark') occupy a slight eminence in the centre of the city. The mosques are said to be 365 in number, Bokhara being the centre of Islamitic life and learning in Central Asia. The most imposing one occupies a square of 300 feet, and has a cupola 100 feet high, ornamented with blue tiles. Attached to it is a tower of about twice the height, from which till 1888 criminals were hurled. The city contains over 100 schools and colleges, attended by some 10,000 students; among these, in past times, have been pupils from India and Chinese Turkestan. A canal intersects the city, but the water, which becomes very scarce in summer, is at all times a source of disease from the filthy state in which it is kept. Although ancient, the city is not as old as Samarkand. Bokhara has long been the most important commercial town in Central Asia. Silks, woollens, carpets, and swords are manufactured, and there is a large trade in Russian goods; the town boasts fifty caravanserais and as many bazaars, gorged with the richest ware of Europe and of Asia. Bokhara is connected by a narrow-gauge line (8 miles) with New Bokhara, a Russian town on the Transcaspian Railway. The population is estimated at from 70,000 to 100,000 (including a number of Jews). See TURKESTAN.

Bokhara Clover. See MELILOT.

Boksburg, an important coal and gold mining centre in the Transvaal, on the Witwatersrand, 15 miles east of Johannesburg; pop. (1921) 38,115 (including 12,406 Europeans).

Bolan' Pass, (1) a narrow, precipitous gorge, about 54 miles long, ascending in a generally north-west direction from Kolpur (or Kharlakai Kotal) to Rindli, and lying pretty directly between Sind and Kandahar. The ascent is about 5900 feet. Along the bottom of the pass descends a torrent, now repeatedly bridged by a good military road; and in 1885-86 a railway was laid for military purposes. The route, without being impracticable, is highly defensible in a military point of view, and is commanded by the fortress at Quetta, now British. It is bounded throughout by eminences which sometimes attain a height of 800 feet; and yet, in 1839, a British column of artillery accomplished the whole distance in six days. From the northern outlet there is no fall, and a good road runs to Quetta, 25 miles away.—(2) A district of Baluchistan, area 896 sq. m., including the pass, the civil station of Rindli, and jurisdiction over the road and railway to within 13 miles of Quetta.

Bolas (Span., 'balls'), missiles used by the natives and *gauchos* of southern South America, consisting of two heavy balls, generally of stone covered with leather, connected by a plaited thong 6 to 8 feet long. One bola is held in the right hand, while the other is swung rapidly round the head, at the full extent of the thong, and both are discharged at the animal to be captured, so as to wind round its feet, and bring it to the ground. In another form of bolas there are three balls, not of the same size, connected at the common centre by three short thongs or ropes.

Bolbec, a busy town in the French department of Seine-Inférieure, 19 miles ENE. of Havre by rail. A stream of the same name supplies water-power for several mills, where woollens,

linen, cotton, and chemicals are manufactured. Pop. 10,000.

Boldrewood, ROLF, pseudonym of Thomas Alexander Browne (1826-1915), author of *Robbery under Arms* (1888), *The Miner's Right* (1890), and *Old Melbourne Memories* (1895)—perhaps his best book. Born in England, he was taken to Australia in 1830 by his father, Captain Sylvester John Browne, one of the founders of Melbourne; and there, after a good education and a varied experience in stock-farming and other vocations, he became a police magistrate and goldfields commissioner. He retired in 1895.

Bole is an earthy mineral resembling clay in structure, and consisting essentially of silica, alumina, red oxide of iron, and water, which occurs in nests and veins in basalt and other basic igneous rocks. It feels more or less greasy when placed between the fingers; is of different colours—yellow, red, brown, and black; has a dull, resinous lustre, but a shining streak; and is readily friable and not plastic. Armenian bole has a red tint, and is used for colouring tooth-powders and false anchovies. Lemnian Earth (containing a large percentage of silica) is the bole from the island of Lemnos; it is red in colour, and was at one time prescribed as a tonic and astringent medicine—no doubt from the large percentage of oxide of iron present. The boles which are employed in veterinary practice in Europe are generally made from Armenian bole. The savage tribes in South America eat bole to allay the pangs of hunger. When bole is calcined, it becomes hard; and when afterwards levigated, a coarse red kind is used as a pigment. French bole is pale red; Bohemian bole, reddish yellow; Silesian bole, pale yellow; and Blois bole is yellow.

Bole-ro, a Spanish national dance, invented in 1780 by the dancer Sebastian Zerezo. It is danced in moderately quick three-quarter time by two persons to the accompaniment of the castanets and the guitar. The name is also applied to the air to which it is danced. Like the *fandango* it is said to be originally a refinement of an African dance still performed by the Congos under the name of *chika*.

Boletus, a genus of Hymenomycete Fungi (q.v.). The older botanists included in it the numerous species now forming the genus *Polyporus* (see AMADOU, DRY ROT, and POLYPORUS) and other genera; but even as now restricted, it includes about one hundred European species. Most of the species resemble the common mushroom and other species of *Agaricus* in general form, but are distinguishable at a glance by the pore-like surface occupying the place of gills. Unlike *Polyporus*, the whole spore-bearing tissue (hymenium) is easily detached. Some of the species



Boletus edulis.

are edible. *B. edulis* is much used in France, also in Germany, Hungary, Russia, &c. It is the *ceps ordinaire* of the French markets. It grows on the ground in thin woods of oak, chestnut, or beech, and sometimes in mountainous districts, in places covered with moss, heath, or grass. In moist warm summers it sometimes appears in prodigious quantities. It has also been partially cultivated by inclosing a portion of a wood, and watering the ground with water in which the plant has been steeped, thus, in fact, sowing its minute

spores. In Britain it is comparatively rare. The cap is smooth, 6 or 7 inches across, with a thick margin, varying in colour from light brown to brownish black; the tubes at first white, then yellow, and finally yellowish green; the stem thick and solid, beautifully reticulated. The tubes are removed along with the skin and stem, and only the flesh of the cap is eaten, which is firm, white, delicate, of agreeable smell, and is prepared like the common mushroom, dried to flavour sauces, ragouts, &c., or eaten raw with salt and pepper. It is wholesome and nutritious, and is certainly to be reckoned one of the very best of the edible fungi.

—*B. scaber* is another edible British species, but much inferior.—*B. aeneus* is the *ceps noir* of the French markets, and *B. aurantiacus* is the *girolle rouge* or *roussille*. They are used like *B. edulis*. Forms of which the flesh turns blue when broken and exposed to the air, should be avoided as probably poisonous.

Boleyn, ANNE, second wife of Henry VIII., was born in 1507, and was the daughter of Sir Thomas Boleyn, afterwards Viscount Rochford and Earl of Wiltshire, by Elizabeth Howard, daughter of the Duke of Norfolk. She spent some three years (1519-21) at the court of France, and soon after her return to England was wooed by Lord Henry Percy, the heir to the earldom of Northumberland, and by King Henry himself, who in the April of 1522 began to shower wealth and honours on her father, and who ere this had dishonoured her sister Mary. Not till the king's divorce from Catharine of Aragon was set afoot (in May 1527) does Anne seem to have favoured his addresses; but long before Cranmer pronounced the divorce (23d May 1533) she was Henry's mistress, and in the preceding January they had been secretly married. She was crowned with great splendour in Westminster Hall on Whitsunday; but within three months Henry bade her 'shut her eyes to his unfaithfulness, as her betters had done, for he could abase yet more than he had raised her.' His cooling passion was not revived by the birth, in September 1533, of a princess, the famous Elizabeth, still less by that of a still-born son, on 29th January 1536, barely three weeks after the death of Queen Catharine. On next May-day the king rode off abruptly from a tournament held at Greenwich, leaving the queen behind, and on the morrow she was arrested and brought to the Tower. The story runs that his jealousy was kindled by her dropping a handkerchief to one of her lovers in the lists below; anyhow, a week before, a special commission had been secretly engaged in examining into charges of Anne's adultery with her own brother, Lord Rochford, with Sir Francis Weston, Henry Norris, and William Brereton, gentlemen of the privy chamber, and with Mark Smeaton, a musician. Only Smeaton made any confession; but on the 12th the four commoners, on the 15th Anne and her brother, were tried and convicted of high treason. Her own father and her uncle, the Duke of Norfolk, were instrumental in her death, the latter presiding over her judges, the twenty-six peers, and pronouncing her doom. No vestige of the evidence remains. On the 17th Smeaton was hanged, and the other four beheaded; and two days later, upon Tower Green, Anne submitted her slim neck to the headsman's axe. Henry the next day married Jane Seymour. That Anne was guilty of adultery with Henry is certain; that she was guilty of incest with her brother, or even of adultery with her other alleged paramours, remains at least not proven. The character of this 'mother of the English Reformation' was not saintly; but she probably was not the Jezebel that Nicholas Saunders would have us believe.

According to him, she was even in person ugly, misshapen, monstrous; whereas we know that she was a comely brunette, her only defect a supplemental nail. See Hepworth Dixon's *History of Two Queens* (1874); Paul Friedmann's *Anne Boleyn* (1885); Martin Hume's *Wives of Henry VIII.* (1905); and works cited under HENRY VIII.

Bolgary, a village in the Russian government of Kazan, near the Volga, with about 150 houses. It occupies the site of Bolgar, capital of the old Bulgarian kingdom, remains of which, in the form of ruined buildings, walls, and minarets, yet attest its former state.

Bolgrad, a town in the Rumanian region of Bessarabia, 28 miles NW. of Ismail, at the head of Lake Yapuch, a feeder of the Danube. It is well built, and has some trade and manufactures of soap, candles, pottery, &c. Pop. 13,000, many of them Bulgarian immigrants.

Boli, an ancient town of Asia Minor, on the left bank of the river Boli, 136 miles E. by S. of Constantinople. Pop. 5000.

Bolide is a name given to a large meteor which explodes and falls in aerolites; a fire-ball. See METEORS.

Bolingbroke, HENRY ST JOHN, VISCOUNT, one of the most gifted of English statesmen and orators, was born at Battersea, on October 1, 1678. He belonged to a good family, and was educated at Eton. The statement which his various biographers have repeated of his having matriculated at Christ College, Oxford, has been disproved by recent research. After travelling on the Continent, he entered parliament in 1701 as member for Wootton Bassett. There were at the time three political parties, the Jacobites, the Tories, and the Whigs. Bolingbroke joined the Tories, and gained immediate distinction by his vigorous and polished eloquence. From 1704 to 1708 he was Secretary for War in the Godolphin ministry; in 1710 he became Foreign Secretary, and shared the leadership of the party with Harley. He was called to the House of Lords in 1712, and in 1713 he negotiated the Peace of Utrecht. This was the one act of his political career which was of benefit to his country. It did not, however, bring him popularity as a statesman, and he estranged his followers by his morbid love of secret scheming, his desire to do everything alone and in the dark. After plotting successfully for Harley's downfall, he set to work to form a Jacobite ministry in July 1714. A week afterwards his designs were shattered by the death of Queen Anne. George I. came to the throne, and Bolingbroke, who had intrigued on behalf of the Stuart cause, fled to France. He was attainted in 1715, and acted for some time as Secretary of State to the Pretender. While living abroad he wrote his *Reflections on Exile*, and addressed a letter to Sir William Wyndham, in vindication of his political career. His first wife, a daughter of Sir Henry Winchcomb, having died in 1718, he married in 1720 the rich widow of the Marquis de Vilette. By the shrewd use which he made of this lady's wealth, he obtained permission to return to England, where he was not allowed, however, to sit in the House of Lords. He then settled at Dawley, near Uxbridge, and became the associate of Pope, Swift, and other men of letters. It was his ambition to be ranked among philosophers, but the ethical studies in which he engaged could not wean his attention from politics. He intrigued in London for an office which he never obtained, and attacked Walpole with the utmost bitterness in a series of letters which appeared in the *Craftsman*, and were reprinted as *A Dissertation on Parties*. Disappointed in his hopes of readmission to political life, he returned to France, where he

remained from 1735 to 1742. During these years he produced *A Letter on the True Use of Retirement*, and his most important contribution to literature—the *Letters on the Study of History*. The precepts which he laid down for the historian's guidance were indorsed by Voltaire and carried into practice by Macaulay. Bolingbroke's last years were spent at Battersea, where he wrote his *Letters on the Spirit of Patriotism*, and his *Idea of a Patriot King*. He died, after a long illness, on the 12th December 1751. 'The Alcibiades of his time,' Bolingbroke is one of the most interesting and brilliant figures in English history. He was idolised by his contemporaries for the grace of his person, the charm of his manner, and the splendour of his talents. An admirable speaker and writer, he was not a great statesman—hardly a skilful party leader. He was the arch-intriguer of his time; as a politician he was thoroughly selfish and insincere. In his writings he preached a double morality; while he considered Christianity a fable, he held that a statesman ought to profess the doctrines of the Church of England. His philosophy is sensational; and as a cynical critic of revealed religion, he was accounted one of the notable English deists. His works, philosophical and political, are written in an oratorical strain. They are models of polished, pointed, declamatory prose. They deserve to be studied if only for the merit of the style; their matter is of less interest, but their wit retains its edge, and their eloquence its glow. Bolingbroke's collected works were published by David Mallet in 1753-54.

See *Bolingbroke, a Historical Study*, by J. Churton Collins (1886); *Bolingbroke*, by A. Hassall (1888; revised 1915); *Bolingbroke and his Times*, by Walter Sichel (2 vols. 1901-3).

Bolívar, the name of several states and territories of South America.—(1) A state or department of Colombia, which in repeated redvisions of the country has not always held its place. The surface is mostly low and well watered, with many swamps; the climate in some parts is hot and unhealthy. Capital, Cartagena; chief port, Barranquilla.—(2) The largest of the United States of Venezuela, extending from Colombia to the Atlantic, and watered by the Orinoco and its tributaries; area, 90,000 sq. m.; pop. 70,000. The state is frequently called Guayana; for its capital, Ciudad Bolívar, see ANGOSTURA.—(3) A province of the republic of Ecuador; pop. 50,000.—(4) An agricultural settlement of Venezuela, 30 miles NE. of Carácas, founded in 1874 to receive immigrants.

Bolívar, the Venezuelan monetary unit, answering to the franc.

Bolívar, SIMÓN (named *El Libertador* for having rescued South America from the Spanish yoke), was born in Carácas, in what is now Venezuela, July 24, 1783, and was descended from a noble and wealthy family. He studied law at Madrid, and visited several other capitals, witnessing in Paris the closing scenes of the Revolution. In 1801 he returned to Carácas, but on the death of his young wife he came to Europe again in 1804, and in 1809 visited the United States, from which he returned with the determination to free his country from foreign despotism. Arriving in Venezuela, he at once associated himself with the patriots there; and after the insurrection at Carácas in 1810, he was sent to London with a view to interest the British cabinet in their aims. The British government, however, declaring its neutrality, Bolívar speedily returned. On the declaration of independence by Venezuela on July 5, 1811, war was commenced by the Spaniards, and

Bolívar fought under General Miranda in several successful engagements. The royalists having again obtained possession of Venezuela, Bolívar had to flee to Curaçao; but in September 1812 he joined the insurgents in New Granada, and driving the Spaniards back beyond the Magdalena, recrossed the frontier with a force of 500 men, and proclaimed a war to the death. His army increased with each victory; and on August 4, 1813, he entered Carácas as a conqueror, and proclaimed himself dictator of western Venezuela. Fortune soon deserted the patriots, however; in June 1814 they were routed at Cura, and 1500 slain. Bolívar was compelled to retire to Cartagena, and, after some further service in New Granada, to Kingston in Jamaica, where an assassin, hired by the Spaniards, tracked his steps, but by mistake murdered his secretary. Having visited Hayti, and assembled there the insurgent refugees (1816), Bolívar twice landed in Venezuela; he was finally compelled to flee to Barcelona, and there formed a provisional government. The following two years were marked by a series of conflicts in which the scattered parties of patriots were most frequently beaten. In 1819 a congress was opened at Angostura, and Bolívar was confirmed in the supreme power. Having conducted his army, of which the British legion formed a third, over the almost impassable Cordilleras to New Granada, he achieved the victories of Tunja and Boyaca, and soon afterwards declared New Granada united with Venezuela as a republic, under the name of Colombia. Nevertheless, although Bolívar had a force at least twice as large as Morillo, the dissensions of the patriots prevented any concerted action, and it was only in June 1821 that the victory of Carabobo virtually ended the war in Venezuela; while it was not till July 1824 that the royalist troops were finally driven out of the country. The constitution of Colombia was adopted on August 30, 1821, and Bolívar was chosen president.

In 1822 Bolívar added Ecuador to the republic, and was summoned to help the Peruvians. Bolívar was named dictator of Peru, from which possession also the Spaniards were driven, after more than two years' fighting. In 1825 Bolívar visited Upper Peru, the name of which was changed in his honour to Bolivia. A constitution prepared by him in 1826, at the request of the Bolivians, excited dissatisfaction and even alarm, chiefly on account of its proposal to intrust the executive power to a president for life, without responsibility, and with power to name his successor. In September he intrusted the government of Peru to a council appointed by himself, and returned to quell a disturbance in Venezuela. His personal influence prevailed, and he was re-elected president, in spite of his expressed unwillingness; but meantime, in Peru his famous code had been renounced, and the Colombian troops had been expelled from Bolivia. His assumption of supreme power in August 1828 roused the apprehension of the republicans; the dread of a second Napoleon led to a conspiracy against his life; and in November 1829 Venezuela separated itself from Colombia. In consequence, Bolívar laid down his authority in April 1830, when the congress of Bogotá, now largely made up of his enemies, voted him a pension of 3000 dollars, on condition of his residing abroad. He died at San Pedro, near Santa Marta, 17th December 1830. Bolívar has been described as the Washington of South America. The difficulties of the war of liberation compelled him to assume a dictator's power, but there is no proof that he was ever insincere in his devotion to liberty; and in the service of his country he not only gained no wealth, but freely spent his own large fortune. In

1842 his remains were removed with great pomp to Carácas, where a monument has been erected to his memory; statues have been raised to him at Bogotá, Lima, and New York; and the Liberator's centenary was celebrated at Carácas in 1883.

See books by Ducoudrey-Holstein (1880), F. Lorraine Petre (1910), Mancini (1912). The Spanish pronunciation of his name is *Boleávar*.

Bolivia, a republican state on the west side of South America, formed in 1825, and deriving its name from Bolívar. Formerly called Upper Peru, it was till 1825 part of the viceroyalty of Buenos Aires. It extends between 9° 30' and 23° S. lat., and 57° 30' and 69° W. long., and is enclosed by Peru, Brazil, Paraguay, the Argentine Republic, and Chile. A portion of the Paraguayan frontier has been for some time undetermined. Its coast provinces Bolivia lost to Chile in consequence of the war of Bolivia and Peru with Chile in 1879-83. Bolivia's case was put before the League of Nations in 1921. A wide region in the north was long claimed by Bolivia. Negotiations during the 20th century have assigned the greater part to Brazil and Peru. The area of the republic is estimated at about 600,000 sq. m. The population is estimated at 3,000,000, of whom about half are Indians.

Surface and Hydrography.—Prior to the treaty of 1884 Bolivia contained the loftiest and most mountainous district of America; but as since then her western frontier has been bounded by the Andes, this claim would now be only partly true. The lofty plateau of Oruro and Potosí, with an average height of 10,000 to 13,000 feet, and an area of about 66,000 sq. m., is enclosed between the Andes proper and the Cordillera Real, to the east. There are also intermediate ranges and isolated groups; and the summits of the western and eastern chains include Sahama or Sajama (a volcano), Illampu or Sorata, and Illimani, all over 21,000 feet high. The great plateau falls into two parts, of which the northern is the more inhabited, the Lake of Titicaca (partly in Peru) and the many well-watered valleys around making the district not so unproductive as its great elevation would otherwise render it. This lake, with an area of more than 5000 sq. m., and a depth of 160 fathoms, encloses several islands, the largest of which was the home of the founders of the empire of the Incas. It lies 3800 metres above sea-level. The Río Desaguadero, with a course of 160 miles, connects it with the salt lake and swamps of Aullagas or Paria, very much smaller than Titicaca; and somewhat to the west lies the Laguna de Coiposa, a basin covered, in the dry season, with a thick crust of salt. The southern and lower tableland is chiefly a desert, where the mountain streams either sink into the sand, or flood, in the rainy season, what are salt pampas throughout the rest of the year. The Cordillera Real system descends abruptly, on the north, to the plain of the Amazon; but its eastern edge is a series of terraces, sinking gently to the plains of eastern Bolivia, which in the north belong to the Amazon basin, and in the south to the pampas of the Plata. This eastern region is a cradle of both rivers, gathering for the latter the Pilcomayo, with its tributary streams, which flows through the Gran Chaco to feed the Paraguay, and for the former the Guapey or Río Grande, which afterwards becomes the Mamoré, and unites with the Beni (q.v.) to form the Madeira. See AMERICA, ANDES.

Climate and Vegetation.—Although situated entirely within the tropics, Bolivia, from its varied elevation, possesses a wide range of climate and productions. The regions with an elevation of over 11,000 feet are called *punas*, while the *puna brava* is the region of snow and ice above 12,500 feet. This division includes the whole tableland of Oruro and the loftier mountain peaks. The

climate is cold and dry, but generally healthy, in spite of the cutting winds, the extreme rarity of the atmosphere, and the occasional days of great heat, followed by bitterly cold nights. Vegetation is scanty, and cultivation mainly confined to potatoes, barley, and coarse grasses, which maintain the animals of this zone. Here, and in the higher parts of the next region, the dry and rainy seasons are distinguished, the latter extending from November to March. The *cabezeras de valles* are the heads of valleys descending to the lowlands, in the eastern terraces, between 9500 and 11,000 feet; the deeper valleys, between 5000 and 9500 feet, are called *medio yungas*. The former have a temperate climate, and wheat and maize are produced in large quantities; in the latter, tropical fruits begin to flourish. East of the inner Cordillera lie the *yungas*, or plains under the 5000 feet limit. This district, with its numerous streams, its luxuriant tropical vegetation, its rich forests of valuable trees in the north, and its immense open savannahs in the south, surpasses most countries of South America in fertility and resources. Rubber, coffee, rice, cacao, coca, pine-apples, bananas, tobacco, cotton, and the valuable cinchona are cultivated. The rainfall here is uncertain. Intermittent fevers are confined to the northern plains, where the overflowing rivers and rank vegetation are added to a hot and moist atmosphere. In Bolivia generally the rainy season lasts from December to May.

Animals.—In the *punas* are found the guanaco, llama, alpaca, and vicuña—animals almost as independent of water as the camel—and the chinchilla; in the east, jaguars, tapirs, and other wild animals common to Brazil. The first three are prized for their skins, and are also largely employed as beasts of burden; the vicuña yields a long, soft wool; and the chinchilla skins also form a valuable article of commerce. Large numbers of sheep are herded in the highlands, and of cattle in the plains.

Minerals.—While agriculture and stock-raising have never received proper attention in Bolivia, the development of its mineral resources has always been the most important industry of the country; for its great yields of gold, silver, copper, and tin ores have for centuries given a large profit, in spite of the excessive cost of transport. The mines of Potosí, which have been worked since 1545, are estimated to have produced, up to the present, over £600,000,000 sterling of silver. Since the war of independence (1809–25), the industry has been practically uninterrupted, and specially fostered by favourable fiscal regulations. The want of good roads or accessible seaports, and a lack of better fuel than llama-dung or moss, seriously impeded the work; but the extension of railways, and the discovery of coal in several provinces, help to remove these checks. Consequently a great revival in mining enterprise has been noticeable since 1883, many abandoned mines having been reopened. Potosí and Oruro still produce much; but most comes from Huanchaca, to the south-west of Potosí. Lead and quicksilver are often found along with the silver. Of tin Bolivia yields about one-fourth of the world's supply. Gold-mining has been abandoned, except by the Indians, who carry it on in a primitive way; but the metal is still washed in grains from the rivers of the eastern slope and foot-hills of the Cordillera Real. The rich copper-mines have recently been less worked, chiefly owing to transport difficulties. Other minerals are bismuth, zinc, cobalt, wolfram, antimony, borax, salt, and petroleum.

Commerce, Communication, &c.—From the landlocked position of the republic, its foreign trade labours under heavy disadvantages, which the nature of its great rivers, obstructed by rapids, has increased. Prior to the Chilean war its favourite marts were

the Peruvian port of Arica and its own Cobija, now Chilean. But both Argentine and Brazil having granted gratuitous egress through their ports, a great part of Bolivia's productions then drained through these countries. In order to restore the trade to the Pacific, a railway was made from the now Chilean port of Antofagasta, which forks at Uyuni, in Bolivia, one branch going to Oruro and La Paz, the other to the Huanchaca mines. Another railway runs from La Paz to Lake Titicaca, and thence by Arequipa to the Peruvian port of Mollendo. A third trans-Andine line (1912) connects La Paz with Arica, now a Chilean port. At Tupiza, in the south, is the link with the Argentine railways. Thus the pan-American railway is all but complete from Cuzco to Buenos Aires. Bolivia has river communication with the Atlantic by the Paraguay and Amazon systems, the former supplemented by a railway across Brazil, the latter rendered practicable by a Brazilian railway (1914) where the Mamore-Madeira is obstructed by falls. There are about 1500 miles of railways, 7000 of navigable rivers. Exports are tin and rubber; also silver, bismuth, and copper, alpaca wool, chinchilla and vicuña skins. Manufactures are very backward. Rubber, coca, and cinchona plantations attract much attention and capital. Coca is in large demand, both for home consumption and for export.

Population.—The population of Bolivia is a mixture of various races, half-caste Spaniards and Indians, with very few descendants of African negro slaves. About a third of the people live in the towns, the remainder in hamlets or in the *Campaña*. Most of the Indians are civilised. The Quichua and Aymará Indians chiefly inhabit the highlands of the west. The former are direct descendants of the Incas, whose language and manners they preserve, and form 50 per cent. of the pure native population; the Aymará are a kindred race, about half as numerous. They are devout Catholics, mild, apathetic, with more endurance than energy, and are mostly *arrieros*, or drivers of llama-trains, or engaged in llama and sheep raising and rude agriculture. The Chiquito and Mojos Indians of the great north-eastern llanos retain part of the civilisation introduced by the Jesuits in the 17th century. The several tribes of nomadic Indians inhabiting the eastern plains are more or less maliciously disposed towards the Spanish race, but their dislike seldom finds expression in overt acts, and in consequence travel in Bolivia is comparatively safe. The half-bred population is about half as numerous as the pure Indian; the *cholos*, a Spanish and Indian mixture, form the most important element, and to them Bolivia largely owes her independence. The religion of the country is Roman Catholic, but others are tolerated; there are four dioceses, including an archbishopric of La Plata. Education is extremely backward, but is advancing. Sucre and La Paz have universities with faculties of law, medicine, and theology, and elsewhere there are single faculties.

Government, &c.—According to the constitution, the executive is vested in a president, with two vice-presidents, and a ministry; while the legislature consists of a congress of two chambers, the Senate and the House of Representatives, both elected by direct suffrage. In practice, the law requiring the election of the president every four years was for long little observed, the supreme power having been almost invariably seized by successful military commanders. Service in the militia is obligatory. There is also a permanent force of 5000 men. Bolivia is divided into eight departments, not including territories. The seat of government has been repeatedly changed. Sucre is now the nominal, La Paz the real, capital. The chief towns are La Paz (100,000), Cochabamba (30,000),

Sucre or Chuquisaca (30,000), Potosí (30,000), and Oruro (30,000).

History.—After a struggle of fifteen years, the battles of Junín, Ayacucho, and the brilliant victory of Tumusla gave to Upper Peru (now Bolivia) its independence. General Antonio José de Sucre called together the first National Assembly, which met at Chuquisaca, or Sucre, and on the 6th of August 1825 independence was declared. The new state received the name of 'República Boliviana' as a homage to its liberator, Simón Bolívar (q.v.); the name was afterwards changed to 'República de Bolivia.' Bolívar was proclaimed father and protector of the nation. His government laid the first basis of the new republic, dictating urgent and opportune measures. Sucre, in Bolívar's absence, assumed the provisional government, and under his wise and virtuous administration important reforms were made, such as new territorial divisions and the organisation of the treasury. Elected president by the Assembly in 1826, he laid before that body the first Constitution, drawn up by Bolívar; but it alarmed the Assembly, which saw in it some monarchical principles. In 1828 Sucre delegated his powers to the ministerial council, but on hearing that the Peruvian forces had invaded the territory, he placed himself at the head of the troops, and after the capitulation of Piquisa fixed the basis for an agreement between the Bolivian and Peruvian Commissioners, afterwards presenting his resignation to congress, which appointed General Andrés Santa Cruz as provisional president. Santa Cruz reorganised the army, promulgated laws, founded universities, and made other important reforms. The General Assembly at La Paz sanctioned the Second Constitution. Santa Cruz formed the confederation of Peru and Bolivia, of which he was recognised at Lima as supreme dictator (1836); but defeated at Yungay, and hearing of Bolivian opposition (1839), he never returned to the country. General José Ballivian was succeeded by General José Miguel de Velasco, who declared himself dictator. He was defeated by General Belzu, who once more restored the constitution of 1839. Don José Córdova, Don José María Linares, and Don José María de Achá succeeded, but the last was deposed by General Margarejo, who declared himself dictator, and was in turn defeated by Colonel Agustín Morales (1871-72). In 1876 General Daza was elected, and it was during his government that the disagreement between Bolivia and Chile took place, when the latter country, before declaring war, occupied the Bolivian port of Antofagasta on the 14th of February 1879, the result being the disastrous conflict between Bolivia, Peru, and Chile, by which Bolivia lost all her sea-coast. As Daza was accused of treason and fled to Europe, General Campero was proclaimed president, and was succeeded constitutionally by presidents Pacheco, Arce, Baptista, and Alonso. La Paz resented the fixing of the capital at Sucre; Alonso fled, and General José Manuel Pando was elected in 1899. Dr Eliodoro Villazon (1909-13) and Dr Ismael Montes succeeded. Troubles arose again under Don José Gutiérrez Guerra. A 'Junta de Gobierno' took over the government in 1920, and summoned an Assembly to elect a president (Dr Saavedra) and reform the constitution. See *Bolivia*, by Paul Walle (trans. 1914).

Bolkhov, a cathedral city of Russia, on the river Ngrá, 37 miles N. of Orel. It manufactures leather, gloves, hosiery, and soap, and has an active trade in tallow, hemp, oil, fruit, and vegetables. Pop. 22,000.

Boll, a measure of capacity for grain, &c., used in Scotland and the north of England. In Scot-

land it is usually equivalent to 6 imperial bushels, but in England it varies from that to 2 bushels—the 'new boll.' It is also a measure of weight, containing, for flour, 140 lb. The word is pronounced *bow* in modern Scots; being entirely a northern word, it may be distinct from the English *boll* (a swelling, pod, or knob), *bowl* (a round vessel), O.E. *bolla*, and be rather from *bolli*, an old Norse equivalent of the same. See a table of its local values in *Old Country and Farming Words* (English Dialect Society, 1880).

Bollandists, an association or succession of Jesuits by whom the *Acta Sanctorum* (q.v.), or Lives of the Saints of the Christian Church, were collected and published (1643-1794). They received their name from JOHN BOLLAND, born in the Netherlands 1596, died 1665, who edited the first 5 vols., containing the month of January in 2 vols. published in 1643, and the month of February in 3 vols. published in 1658. The vast undertaking had been projected by a Flemish Jesuit, Heribert Rosweyde, and on his death in 1629 his collections were intrusted to Bolland, who established himself in Antwerp, opened a correspondence all over Europe, and associated young men of his order with himself in the work. The suppression of the Jesuit order in 1773 caused the removal of the Bollandist Society to the monastery of Coudenberg, in Brussels, till the persecutions under Joseph II. brought about its dissolution. In 1789 the abbey of Tongerlo in Brabant took up the colossal task of carrying on the *Acta Sanctorum*; but scarcely had the 53d volume appeared in May 1794, bringing the calendar down to October 6, when the French occupation, and their destruction of the MS. collections, put an end to the work. In 1837 a new Bollandist association of Jesuits was formed under the patronage of the Belgian government, which set aside a yearly sum of 6000 francs for this object, and in 1845 the 54th volume appeared. Over 60 volumes have now appeared (the parts published in 1887-1910 being devoted to November); and there is thus a prospect of the completion of this vast work, of which Gibbon has truly said that 'through the medium of fable and superstition it communicates much historical and philosophical instruction.' New editions of the older volumes were published in Venice (1734-70) and Paris (1863-83), and since 1882 supplements, *Analecta Bollandiana*, with facsimiles of the more valuable MSS., at Paris and Brussels. See SAINT; H. Delehaye, *À Travers Trois Siècles* (Brussels, 1920).

Bologna, one of the most ancient cities of Italy, beautifully situated on a fertile plain at the foot of the lower slopes of the Apennines, 82 miles N. of Florence, and 135 SE. of Milan by rail. An irregular hexagon, it is inclosed by a high brick wall, 5 to 6 miles in extent, with twelve gates, and is intersected by the canal of Reno, while, on either side, the rivers Reno and Savena sweep past its walls. The streets in the newer parts of the city are spacious and well paved, with rich and varied colonnades, affording shelter alike from sun and rain; in the older portion, the streets are narrow and dirty, and the arcades correspondingly low and gloomy. The city is adorned with many fine palaces of the nobility, which are rich in fresco-paintings by the great masters. Pre-eminently worthy of notice are the Palazzo Pubblico, and the Palazzo del Podestà. The former contains some fine frescoed rooms and galleries; the latter is interesting as having been the prison and death-scene, in 1272, of Enzo, the son of the Emperor Frederick II., and also as containing the archives of the city. There are numerous and important charitable institutions. The great feature of Bologna, however, is its religious

edifices, which are remarkable both for the beauty of their architecture, and the abundance and splendour of the art-treasures they contain. It has more than 70 churches, the most remarkable of which are San Stefano, which is rich in relics, Madonnas, and Byzantine frescoes of the 11th and 12th centuries; San Petronio—which, though unfinished, is the largest church in the town—a noble specimen of Italian Gothic, with a meridian traced on the floor by the astronomer Cassini, and numerous masterpieces both in sculpture and in painting; San Domenico, where the founder of the order lived and died, and where his tomb has been richly ornamented by Michael Angelo and others; and the cathedral dedicated to St Peter, also rich in works of art. In the centre of the city are two remarkable leaning towers, constructed about the beginning of the 12th century: the Asinella, with a height of 274 feet, and an inclination of 3 feet 4 inches, and the Garisenda, with an elevation of 137 feet, and a lean of 8 feet 2 inches. The university of Bologna, the oldest in Europe, claims to have been founded in 425; it certainly dates as a law-school from the 11th century. Its reputation early became so great, chiefly on account of its school of jurisprudence, that students from all parts of Europe were attracted to it. In 1262 the number receiving instruction is stated to have been 10,000, and it was found necessary to appoint professors specially for the students from each country. Medicine has long been the principal study, and the discovery of Galvanism by one of its professors has shed a lustre on the university, which is also celebrated as the earliest school for the practice of dissection of the human body, as well as for the fact, that for centuries learned female professors have prelected within its walls. The students now number about 3000, and the university still holds a first rank among Italian educational institutions; its eighth centenary was celebrated in 1888. See UNIVERSITIES. Bologna also possesses an academy of music of some note (1805), at which Rossini studied. The university library contains 260,000 vols., many of them very rare and valuable, and 6000 MSS., and there is a city library of 200,000 vols. The Accademia delle Belle Arti is particularly rich in the works of those native artists who founded the far-famed Bolognese school of painting, and it has also some fine specimens of other schools. Bologna has given 8 popes and more than 200 cardinals to the Church. There are some important manufactures, including silk goods, velvet, crape, wax candles, musical instruments, chemical products, paper, cards, and sausages almost as celebrated as its paintings. Pop. (1872) 115,957; (1881) 103,998; (1911) 172,628.

Bologna owes its origin, which is said to be much more remote than that of Rome, to the Etruscans, by whom it was called *Felsina*. It was afterwards, as *Bononia*, the chief town of the Boii, from whom it was taken by the Romans and made a colony (189 B.C.). After the fall of the Roman empire, it passed into the hands of the Longobards, from whom it was taken by the Franks. Charlemagne made it a free city, and the citizens were afterwards invested with the choice of their own judges, consuls, and magistrates. The feuds of the Guelph and Ghibelline factions led in 1506 to the downfall of the republic, and the supremacy of the papal see. In 1796 Bologna was taken by the French, and was constituted the chief town of the Cisalpine Republic; in 1815 it reverted to the pope. In 1848 the Austrians vainly attempted to take the town; but in 1849 they captured it after a ten days' siege. In 1859 the Bolognese sympathised with the national cause, and in 1860 voted, by 1000 to 1, for annexation to Italy. The fertile province of Bologna, with an

area of 1430 sq. m. and a pop. of 600,000, produces much rice and silk. The Bolognese School (see PAINTING) included Francia, the three Caraccis, Domenichino, Guido Reni, and Guercino.

See Burton's *Etruscan Bologna* (1876), and Miss Coulson James's *Bologna, its History, Antiquities, and Art* (1910).

Bologna, GIAN, or GIOVANNI DA (1530–1608), called 'Il Fiammingo' (The Fleming), was born at Douai, and, settling in Italy, was recognised as one of the great sculptors of the Renaissance. He worked mainly at Florence under the patronage of the Medici. His masterpiece is the fountain at Bologna.

Bologna Flask, or PHILOSOPHICAL PHIAL, is a short, thick, narrow glass vessel, close at one end, and open at the other, which the glass-blower prepares from each pot of metal before employing it in the fashioning of tumblers, glasses, bottles, &c. (see GLASS). It serves the purpose of enabling the glass-manufacturer to judge of the colour and other conditions of the fused glass or metal; and as the flask is not subjected to annealing, it is very friable, and a small angular fragment of any mineral allowed to drop into it, at once causes it to fly in pieces. It is curious to notice, however, that a Bologna phial will bear a very heavy blow on the outside without being fractured.

Bologna Stone, or BONONIAN STONE. In the end of the 16th or beginning of the 17th century, Vincent Casciorolo, a shoemaker of Bologna, made the very remarkable discovery that the mineral now known as heavy spar (barium sulphate), which is found near Bologna (as it is in a great many other places), when reduced to a fine powder, mixed with charcoal, dried, and strongly heated in a covered crucible, is converted into a substance having the property of shining in the dark. Casciorolo mentioned his discovery (1602) to the alchemist Scipio Begatello and the mathematician Maginus, and the latter made the substance (first called by its discoverer 'capis solaris,' but soon from the place where it was prepared, 'the Bologna, or Bononian Stone') famous by the specimens which he sent about. Peter Potier (or Poteras), a French chemist resident in Bologna, first published (1622) a recipe for making it.

The substance is essentially sulphide of barium, but its phosphorescent character depends very much on the way in which it is prepared, and many processes have been described. It shines in the dark only if it has previously been shone on, seeming slowly to give out the light it has absorbed. The now well-known 'luminous paint' is made up of this or of other similar and similarly prepared sulphides. See PHOSPHORESCENCE.

Bolometer, an instrument invented (1881) by Professor Langley for the measurement of the intensity of radiant heat—essentially a Wheatstone's Bridge (see ELECTRICITY), arranged so that no current passes through the galvanometer. The arms of the bridge are made of a substance the resistance of which varies greatly with the temperature. Hence, if one arm be exposed to radiation from which the other is screened, the galvanometer needle will be at once deflected. The instrument may be made much more sensitive than a thermopile. A good one can measure variations of temperature of $\frac{1}{100000}$ th of a degree centigrade, and can detect a variation of $\frac{1}{1000000}$ th.

Bolor-Tagh is a lofty border-ridge of the Pamir plateau, ranging SW. to NE., which falls abruptly to Kashgaria (see ASIA, PAMIR, TURKISTAN). There was near this range an ancient kingdom of Bolor.

Bolsec, JEROME. See CALVIN.

Bolsena (ancient *Volsinii*), a town in the province of Rome, on the north shore of the Lake of Bolsena (*Lacus Volsiniensis*), 20 miles NNW. of Viterbo. It is now little more than a village; but prior to 280 B.C. it was a place of great importance, forming one of the twelve Etruscan cities. At Bolsena in 1263 a doubting priest was said to have been convinced of the truth of the doctrine of transubstantiation by witnessing the flow of blood from the Host he had just consecrated; and in commemoration of this miracle (the subject of a masterpiece by Raphael), Urban IV. instituted, in 1264, the festival of Corpus Christi. Half a mile from Bolsena are a few traces of the Etruscan city, and many fragments of the later Roman one remain.—The Lake of Bolsena is a fine expanse of water about 10 miles long and 8 broad, but its shores are very unhealthy. It occupies a volcanic hollow. The Marta River carries its waters into the Mediterranean. It has two islands, Bisentina and Martana, which were favourite autumnal retreats of Pope Leo X. See ETRURIA.

Bolsheviki, the majority party, the more revolutionary of the two sections into which the Russian Social Democratic Party split in 1903, the minority party, prepared for compromise, being called Mensheviks. The Bolsheviks, under the leadership of Lenin, Trotsky, and Tchitcherin, gained the upper hand in November 1917. See COMMUNISM, SOCIALISM.

Bolsward, an old town of Friesland, 15 miles SW. from Leeuwarden. It has a fine Gothic church. Pop. 7000.

Bolton, or BOLTON-LE-MOORS, an important English manufacturing town and parliamentary and county borough in South Lancashire, on the Croal, 11 miles NW. of Manchester. The river Croal divides the town into Great and Little Bolton. It was celebrated as far back as the time of Henry VIII. for its cotton and its woollen manufactures, introduced by Flemish clothiers in the 14th century. Emigrants from France and the Palatinate of the Rhine subsequently introduced new branches of manufacture; and the improvements in cotton-spinning of the middle of the 18th century rapidly increased the trade of the town. Though Arkwright was at one time a resident, and Crompton was born and all his life lived in the parish of Bolton, the opposition of the working-classes long retarded the adoption, in the town, of their inventions—the spinning-frame and the mule. Bolton is now one of the principal seats of the cotton manufacture in Lancashire. Muslins, fine calicoes, quiltings, counterpanes, dimities, &c. are manufactured. There are also extensive foundries and iron-works, bleaching-mills, chemical-works, paper-mills, and dye-works. There are several public libraries, two museums, town cemeteries, parks and recreation grounds, town-hall (1873), market-hall, fish-market, slaughter-house, sewage farm, exchange, mechanics' institute, technical and art schools. Water is brought from Entwistle Moor, a distance of 5 miles. Bolton is a principal station on the London and North-western Railway. It is the birthplace of the daily evening press (*Bolton Evening News*), and has several evening and weekly newspapers. During the Civil War the Parliament garrisoned Bolton; in 1644 it was stormed by the Earl of Derby, who was beheaded there in 1651. A canal was made from Manchester in 1791. Since 1832 it returns two members to parliament. Pop. (1871) 92,655; (1881) 105,973; (1911) 180,851; (1921, in holiday season) 178,678.

Bolton Abbey, Yorkshire, is situated in a highly picturesque district on the river Wharfe, 6 miles E. of Skipton, and 21 NW. of Leeds. Founded for Augustinian canons about 1150, it

has been celebrated by Wordsworth in *The White Doe of Rylstone* and *The Force of Prayer*. The remains range from Early English to Perpendicular; and the nave of the church has been restored for service. The old barn of the abbey is still in use; and the gateway, familiar through Landseer's picture, has been incorporated in Bolton Hall, a modern seat of the Duke of Devonshire.

Boma, a port on the right bank of the Congo, 50 miles from its mouth, capital of Belgian Congo till its supersession by Kinshasa. See CONGO.

Bomarsund, a fortress on Åland Island, commanding the Gulf of Bothnia. In August 1854 it was destroyed by an Anglo-French force, after a six days' bombardment. The treaty of Paris bound Russia not to restore it. See ÅLAND ISLANDS.

Bomb. The word is derived from *bombos*, signifying a deep humming noise, and is probably onomatopoeic. It occurs in most European languages with nearly similar spelling and with similar meaning. It denotes a hollow vessel, usually of iron and of spherical shape—though not necessarily the latter—containing explosive, incendiary, smoke-producing, and, latterly, poisonous material. In ancient English works on Artillery and lists of ordnance stores it was applied to the hollow projectiles for ordnance, which, since about 1750, have been termed Shell (q.v.). Thus we have in a Board of Ordnance warrant, for service in Flanders, dated 27th February 1692, '200 Boombs' for the 8-inch howitzers. But the term, after the date named, came to signify an explosive missile thrown by hand or deposited on the ground in contradistinction to a missile thrown from a gun, howitzer, or mortar. As a result of the war of 1914-18 the old practice has been revived, and the projectiles for the smooth-bore trench mortars, described hereafter, are termed bombs, though they are elongated and not spherical, and closely resemble shell both internally and externally. The name is applied, more legitimately perhaps, to the missiles dropped from aircraft. The hand-grenade is really a small bomb, and the 'depth charge' a bomb used at sea, and some account is given of both hereafter.

Whether we call them bombs or shell, the war of 1914-18 resuscitated the use of explosive and other missiles projected from smooth-bore mortars, and of hand-grenades, in a very remarkable manner. It was a striking case of like causes producing like effects; for, just as the soldier of old was supplied with hand-grenades, and the artillery with small mortars throwing shell, for use in the trench warfare which was a necessary concomitant of the innumerable sieges occurring in the wars of the past, so the trench warfare which started early in 1915 brought about an insistent demand for an armament which it was previously generally believed had been finally relegated to museums. The occurrences at the siege of Port Arthur in the Russo-Japanese war (1904-5) did not do much to shake this view, although at that siege hand-grenades and bombs thrown by trench mortars were used plentifully. Most nations, including Great Britain, however, did adopt a hand-grenade charged with a modern high explosive, but did not manufacture any large supply of them, or take any serious steps in training troops in their use; while, so far as is known, nothing was done by any nation to provide an armament of trench mortars. Consequently, just as at the siege of Port Arthur, hand-grenades and missiles for trench mortars were at first improvised from food-tins filled with gun-cotton surrounded with bits of iron, with a piece of slow-burning Bickford fuse fixed into a detonator containing fulminate of mercury inserted in the gun-cotton and lit by a match or by the flash of discharge of the mortar to cause explosion of the missiles after striking; and trench mortars were

made out of any lengths of iron piping available, with an end plugged up. It may be remarked that gun-cotton, Bickford fuse (see FUSE), and detonators, being articles of regular equipment for demolition by explosion, were available in considerable quantities. The propellant used was gunpowder. It is unnecessary to give any detailed account of the missiles and mortars used during the early stages of trench warfare. All the combatants went through the improvisation stage in the field, and all made strenuous efforts to make up for their unpreparedness by organised manufacture at home on an enormous scale—to improve designs latterly, but in the earlier stages to produce the best of the existing improvised patterns, which, if crude, were usually capable of rapid production. The production of bombs for aircraft, however, did not pass through this improvised stage, as these missiles, for reasons explained hereafter, demand organised resources for their satisfactory manufacture.

Some account will now be given of the various articles which may be included under the heading of bombs, and of the mortars and other means of propelling them.

The Hand-grenade.—The word grenade is derived from a word of very similar spelling, denoting the pomegranate in languages derived from Latin. This missile dates back to the 16th century at least; and so much was it used that in the latter half of the 17th century grenadier companies of picked men were formed in the regiments of all armies, and these companies existed in the British service up to 1858. Grenades have been made of all sorts of material, including glass, but for at least three hundred years prior to 1904 had been, in all armies, hollow spheres of iron weighing about 3 lb. and containing about 4 oz. of gunpowder. They were provided with a small conical wooden fuse (see FUSE) driven into, and jammed in, the filling-hole (see fig. 1). This fuse was lighted either by slow-match (hemp rope steeped in solution of saltpetre mixed with wood ashes), or by a friction bar embedded in the fuse-composition (see *Tube* under CARTRIDGE). The fuse burnt about seven seconds, and immediately after its ignition the grenade was thrown, and a trained man could throw it about 25 yards. They were formally declared obsolete in the British service about 1898, but had not been made for many years, and it is doubtful if any hand-grenades of this kind have been made by any nation since about 1860. But they were very efficient having regard to the explosive they contained, and, as will be seen from what follows, contained all the essentials of hand-grenades as perfected by the latest war experience. The high explosives (see DY-

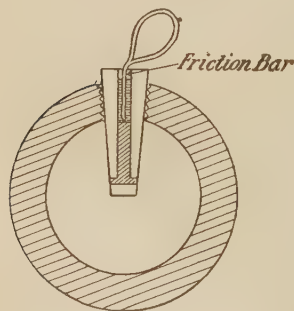


Fig. 1.—Section.

NAMITE) used in modern hand-grenades enabled a grenade much lighter than 3 lb. to be equally, if not more, efficient.

Ignition by time-fuse, whether made of wood, or of the Bickford type, made of woven fabric, while simple, has two drawbacks: firstly, the necessity for ignition by a match just before the grenade is thrown, unless some sort of draw-bar ignition is embodied in the fuse, as in the old French grenade shown in fig. 1 above. Both these methods of ignition are liable to failure at the critical moment from exposure to wet. Secondly, as the time-fuse must burn for its full time of about seven seconds before

the grenade explodes, it is possible, if it be thrown to a short distance, for those attacked to take cover from the explosion, or even to pick up the grenade and throw it away. Consequently the Japanese in 1904-5 introduced a grenade acting by percussion, and a pattern of a similar kind was adopted in 1908 by Great Britain and by other powers at, or about, the same time. Now the correct functioning of any simple percussion-fuse, whether of the 'graze' or 'direct action' type (see FUSE), demands that the fuse shall always strike the ground or objective so that the needle shall be driven on to the detonator; and, as the fuse is usually fixed in the nose of the grenade, that the latter shall strike point first. As a missile thrown by hand, or the projectile projected from a smooth-bore gun, may strike in any position, steps must be taken, by the provision of vanes or streamers, suitably attached to the rear of the missile, to catch the wind, and so to keep the point leading. The grenades adopted shortly after 1905 were practically all of the 'stick' variety; that is, they consisted of a cylinder of iron, or of tin-plate with iron or lead rings surrounding it to produce fragments on explosion, fastened to a wooden or cane stick with a bunch of tapes attached to the handle (see fig. 2). The cylinder was filled with a high explosive in which was embedded a detonator of fulminate of mercury. Usually a 'direct action' percussion arrangement was provided whereby a needle, attached to the inside of the front closing cap, could be crushed down and strike the detonator. Suitable safety arrangements—usually a safety-pin preventing the needle striking the detonator even if the grenade were given a very severe blow on its nose—removed just before throwing, were provided to give safety in handling and transport. These 'stick' grenades weighed about 2 lb. and had bursting charges of about 3 to 6 oz.

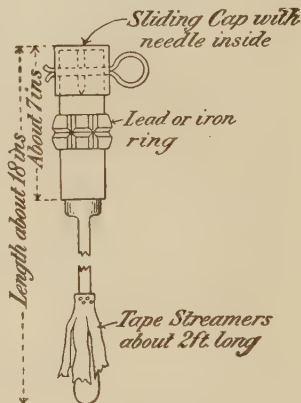


Fig. 2.

The objection to these and the other innumerable patterns of percussion hand-grenade are twofold. In the first place, the uncertainty of their action on striking. With a good long throw, so that the blow on striking is fairly heavy and the streamers have time to act, and if the object struck is not very soft, correct action usually results; and this is also usually the case with a short throw carefully made; but, unfortunately, experience proved that failures were frequent. In the second place, it was found that when swinging back the stick to throw the grenade, the nose was apt to be struck against the back-wall of a narrow, deep trench, and the grenade was fired prematurely. Consequently this pattern, and another similar to it, but with a shorter stick, were abandoned. It cannot be said that a simple and safe percussion action, which is also certain in its action, has yet been devised for hand-grenades, without the use of some additional means for making the missile travel point first, which shall in its turn be absolutely effective for short throws, made anyhow, and without exercising special care. The Germans used time-fuses in the main, though they had one pattern with a percussion action capable of action in whatever position the missile might

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strike. This, however, involved a somewhat elaborate, and not perfectly certain, method of making the absolutely essential safety device unlock during the flight of the grenade after it has left the thrower's hand. This class of 'Allways' fuse is described hereafter in connection with mortar bombs, with which, owing to the different conditions of their employment, it is quite efficient. With rifle grenades also, which travel point first, a simple percussion is possible. See below.

The result of the experiences described above was reversion in the British service to time action for all hand-grenades, with a self-contained ignition gear by which the fuse is ignited either just before, or by the action of, throwing. At first friction ignition with a draw-bar was used, as in the old French hand-grenade already described; but this system, never entirely satisfactory even under favourable conditions of a good sharp pull with the article to be ignited firmly held, as is a tube in a gun, was rapidly dropped in favour of a percussion-cap, in contact with one end of the Bickford fuse, ignited by a blow delivered either by hand just before throwing, or by a compressed spring released in the act of throwing. The two methods are shown diagrammatically in figs. 3, 4, and 4a.

As to fig. 3, *A* is the iron body of the grenade with a filling-hole, *B*, closed by a plug. *C* is the charge of high explosive of about 4 to 6 oz. *D* is a sheath of brass, but latterly of steel, with thin walls. Inside the sheath, *D*, and resting on a shoulder or contraction, *E*, is the percussion-cap, *F*, in contact with one end of the Bickford fuse, *G*, the other end of which is fixed by crimping into

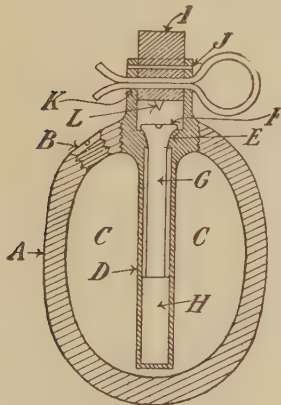


Fig. 3.—Section.

do), the shearing wire is broken and the needle strikes and fires the cap; this lights the Bickford fuse, which, after three to five seconds (usually the latter), according to the length of it used, ignites and explodes the fulminate and thereby the main charge of high explosive. Suitable provision is made so that the hot gases produced by the Bickford fuse as it burns shall escape and not heat up the walls of the sheath, *D*, to the ignition-point of the explosive, *C*, in contact with it.

As to figs. 4 and 4a, the letters *A* to *F* have the same significance as in fig. 3. It will be noticed, however, that the sheath, *D*, is turned back on itself, and that the detonator lies alongside the striker. This is done to give room for the spring striker action without lengthening the bomb unduly. The striker action consists of a hammer with needle (or side-prongs if a rim fire-cap be

used), *M*, which is ready on release to be driven on to the cap, *F*, by the compressed spring, *N*. Prior to release the hammer, *M*, is held by one end of the curved detent, *P*, which fits into a notch,

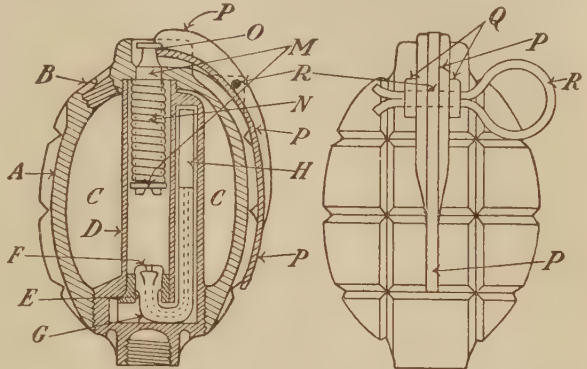


Fig 4.—Section.

Fig. 4a.—Elevation.

O, in the hammer, *M*. The detent, *P*, as shown in fig. 4a, lies close to the outside of the grenade and between two lugs, *Q*, projecting from the latter; it is secured in this position by the safety-pin, *R*. The reason for the great length of the detent, *P*, is to enable it to be held down easily by the hand after the safety-pin is removed and prior to throwing. When the grenade is thrown, the detent, no longer held, is tilted out of its seating by the action of the spring, *N*, and falls away clear of the grenade. The needle strikes the cap, *F*, and the rest of the action is the same as has been described for fig. 3. The action last described is that used in the bulk of grenades, containing about 1½ oz. high explosive, in the British service supplied by millions in the last three years of the war of 1914-18. It weighs about 1½ lb. and is highly efficient, and has only one objection, in that, obviously, if the detent be released accidentally after removal of the safety-pin, ignition takes place instantly. It is in this respect that percussion action, as already stated, must always have a considerable advantage.

Hand-grenades containing smoke compositions and poison-gases were used also. They were usually ignited as described for fig. 3.

The Germans favoured in the main a 'stick' grenade with a rather large charge of about 8 to 10 oz. contained in a tin-plate container; the friction ignition gear was in the wooden handle, though they used also the grenade with the 'Allways' percussion action mentioned above, and a small grenade very similar to that shown in fig. 3 except that its ignition was by friction bar or wire.

The Rifle Grenade.—This is practically a hand-grenade, provided with a percussion mechanism of the 'direct action' or 'graze' type in its nose. Projecting from its base is a steel rod which fits into the barrel of the rifle. A cartridge without a bullet is, of course, required to drive it from the rifle. A grenade, complete with its rod, weighing about 1½ lb., can be projected to a maximum range of about 200 yards with the rifle elevated to 45°. Owing to the violent impulse on firing, the safety and other fittings of the percussion or time fuse can be similar to those in guns, while the rod, acting as a tail, causes the grenade to strike point first. Rifle grenades fitted with stars and a time mechanism, set in action on discharge, are used for signalling purposes.

Trench Mortars.—The trench mortar, as used at the commencement of the war of 1914-18, and for some time afterwards, was only expected to throw a bomb of light construction weighing about

10 lb. to a range of about 400 yards, and not much accuracy was expected from it. The bombs were made of tin-plate strengthened with wood blocks internally, and the explosive was surrounded with steel and iron scrap. The time-fuse was similar to that used for hand-grenades, but the time of burning could be regulated for different ranges by cutting off portions of the Bickford fuse. The mortar was always elevated to 45°, and the range was varied by using different charges. When a demand was made that heavier projectiles should be fired, the principle of the rifle grenade was adopted, and a heavy bomb, having a steel rod about 2 inches in diameter which fitted into a comparatively light tube forming the mortar, was supplied. Though satisfactory from the point of view of giving a mortar which could be transported and handled fairly easily, the plan was dropped after a time, as the shooting was very erratic; while the necessarily heavy rod, to stand the stress of firing, formed a large percentage of the total weight propelled, and did not break up on the burst of the bomb and so add to its destructive power; further, owing to its weight and small air resistance, the rod did not always act as a tail and keep the bomb point first, and the percussion-fuses therefore often failed to act. Gun-cotton charges were used for the smaller mortars, and cordite for those throwing the bombs with rods.

The lighter mortars, i.e. firing bombs up to about 25 lb. in weight, finally adopted are fairly elaborate weapons, though still smooth bore, with a provision for elevation and traversing by screws. Changes of range can be effected by change of elevation between about 45° and 75° with any charge selected, and there are five or more different charges giving ability to fire at all ranges between about 100 yards and 800 yards. The mounting (see fig. 5) consists of two legs, *A*, which are hinged so that they can

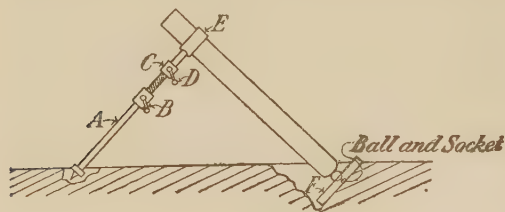


Fig. 5.

be shut together for transport or opened out to support the mortar in front. Above the hinge is a boss in which are the elevating screw and the gear by which it is actuated, the gear being moved by the handle, *B*. At the top of the elevating screw is fixed a cross-head crutch, *C*, carrying the traversing screw worked by the handle, *D*. On this screw is a nut which is fastened to the mortar by means of a collar, *E*, which is detachable. The breech end of the mortar has a ball-shaped boss which fits into a socket in the steel base-plate, *F*, which is well set into the ground at an angle of about 45° to resist the recoil. The base-plate is about 2 square feet in area.

The mortar, legs with traversing and elevating gears attached, and base-plate each form a load which can be carried by one man, the mortar being the heaviest.

Larger trench mortars up to nearly 10-inch calibre, with much heavier appurtenances, have been used, and doubtless will be used again for special purposes. The Germans had rifled mortars mounted on quite elaborate wheeled carriages with recoil buffers, but whether such equipments should be styled trench mortars is doubtful, as they could only exceptionally be used actually in the trenches. They were practically howitzers. (See CANNON.)

Trench Mortar Bombs.—The bombs used in the

later stages of the war were cylindrical with square end, but otherwise differed but little in essentials from shell fired from guns (see SHELL) for similar purposes, except that, being called upon to resist much smaller stresses than in guns, owing to the small charges used, they have thinner walls and contain, in proportion to their weight, larger bursting charges. They have been used, as in the case of gun-shell, with all sorts of contents—viz. high explosives, smoke compositions, incendiary compositions, and poisonous gases. The methods of disposing the propelling charge and of firing it were,

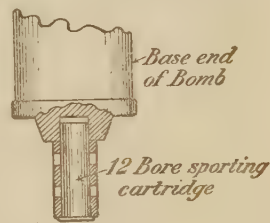


Fig. 6.—Part Section.

however, quite novel. Projecting from the centre of the bottom of the *inside* of the breech of the mortar is a nipple, and attached to the centre of the base of the bomb is a socket made to hold an ordinary 12-bore Sporting Cartridge (q.v.). As the mortar is always fired tilted at a considerable angle, usually not less than about 45°, a bomb, inserted into the muzzle and then released, will slide down to the bottom of the mortar with considerable velocity, and as a result the cap of the cartridge will strike forcibly against the nipple projecting from the inside of the breech, and be fired thereby. The cartridge-socket has perforations in its walls so that the gases of explosion can escape. To reinforce the primary charge in the cartridge, bags in ring form containing explosives can be fitted over the outside of the socket, being ignited by the gases escaping through the perforations. The firing arrangements are shown in fig. 6.

Fuses for Bombs.—Bombs are in some cases provided with tails to make them travel point first; but as these tails must be fairly stout to stand even the low pressures in trench mortars, they add to the weight to be propelled without increasing the number of effective fragments on burst. Usually bombs cannot be depended upon to strike point first any more than hand-grenades, and the fuses used are designed accordingly, and are of two kinds. The first, which is fixed on the head of the bomb, has a striker mechanism on exactly the same principle as that shown in fig. 4, and ignites a piece of Bickford fuse, which is, however, straight, and leads down to a detonator in the middle of the bomb. Owing to the rapid impulse imparted to the bomb on firing, the principle of 'set back' is used to release a securing device which holds the detent, *P*, when the safety-pin is withdrawn prior to firing. The other fuse is similar to that employed by the Germans for hand-grenades, as already stated, and termed the 'Allways.' The action of this class of fuse is shown diagrammatically in fig. 7. *A* is the body of the fuse screwed into the head of the bomb, *B*, and provided with an internal cavity with coned ends. Inside this cavity are the two portions of the percussion mechanism. One part, *C*, carries the needle, *D*, which fits in a hole in the other part, *E*, provided with a detonator, *F*. The two parts are kept apart by a stout pin, *G* (which is ejected by a compressed spring released by 'set back' on firing; the spring is not shown), and a weak 'creep' spring, *H*. The outer ends of *C* and *E* are coned to fit the coned ends of the cavity in the body, *A*. Supposing the pin, *G*, to have been ejected, the two parts, *C* and *E*, would only be kept apart by the weak spring, *H*. If, now, the fuse were moving forwards and were sharply checked, the part *E* will set forward owing to its momentum compressing the spring, *H*, and the needle, *D*, will strike and fire the detonator, *F*, the flash of which will communicate by the channel,

I, with suitable detonating arrangements in the bursting charge of the bomb. Similarly, if the bomb strikes base first, the part *C* will set forward and drive its needle into the detonator. Should the

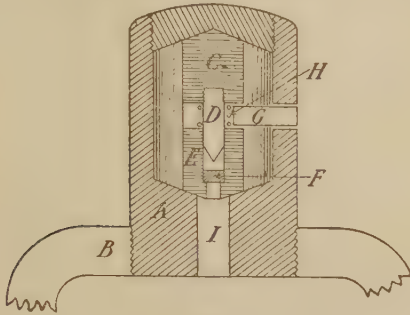


Fig. 7.

bomb strike sideways, the two parts, *C* and *E*, will be pressed together, as their coned ends will slide in the direction of motion along the coned seatings of the cavity. There are obviously many other ways of disposing the parts of fuses of this class, but they all depend upon the slip between a member or members with coned or spherical ends and spherical or coned recesses causing alteration in the space occupied by the system of parts selected.

As pointed out, trench mortars have been made up to about 10 inches calibre and firing projectiles weighing about 150 lb. There are, however, two limitations to an increase of their size apart from the weight of the mortar itself. The first is the difficulty in the transport of ammunition as long as these weapons are used as their name implies; for wheeled transport can only rarely be feasible. Even with light mortars this difficulty hampers movement, and when, for any purpose, their fire is required in quantity, steps must be taken beforehand to accumulate a supply of ammunition at the position from which fire is to be opened. Another limitation is that, if very heavy mortars with correspondingly large projectiles are used, retaliation by artillery fire from guns or howitzers results; and as the slow-travelling large mortar projectile can easily be seen in its flight, it is not difficult usually to locate the place from which it starts and to concentrate fire on it, with the result that the mortar will be destroyed unless particularly well protected. The opinions as to the real value of trench mortars are somewhat divided, but it is generally conceded that, whenever trench warfare on a large scale takes place, the trench mortar will again be required, and be improvised if not immediately available as a recognised armament. There is no difference of opinion, however, as to the value of the hand-grenade for many purposes beside the requirements of trench warfare proper. In the final assaults of temporarily fortified posts such as must frequently occur in so-called 'open' warfare or 'war of movement,' the hand-grenade will play an important part.

Bombs for Aircraft.—These bombs have been made in all sizes, from small incendiary ones weighing less than 1 lb. up to enormous ones of 600 lb. and more filled with high explosive. There is of course, theoretically, no limit to the size of these bombs except the carrying-power of the aircraft using them, but there are the practical limits of cost, ease of handling, and the uncertainty of hitting any assigned objective unless it be very large and the aircraft can descend, without undue risk, fairly close to it before releasing the bomb. This last consideration renders the carriage of more than one bomb very desirable. The first essential of an air-

craft bomb is that it shall strike point first, as this will enable a simple percussion-fuse to be used; this is desirable for all bombs, but it is specially important with those for aircraft, for the bulk of bombing-work is done by aeroplanes, and as these often make very rough landings while carrying their live bombs, it is important that the fuses in the latter shall be strong and simple, and easily provided with thoroughly reliable safety appliances which will prevent their firing by shock due to rough handling. Consequently these bombs are provided with tails and are often made pear-shaped, as this form facilitates attachment of the fins of sheet-steel forming the tail. A common form is that shown in fig. 8. The strength of the bodies of the bombs varies with the work to be done by them. Where perforation of resisting material, or the projection on burst of heavy fragments, is desired, the bomb will have thick walls, and for a given weight will hold less explosive; but where the production of surface effect, such as a large crater, is required, the arrangements are reversed. Bombs are slung below aircraft either head down or horizontally, head in front, and convenient and reliable releasing gear, as well as sights to guide the moment of release, are essential features of aircraft used for bombing. Aircraft bombs have been usually filled with explosive or incendiary material; smoke bombs and parachute light bombs for illuminating purposes are also used. So far as is known, aircraft bombs filled with poisonous gases have not been used by any belligerent. There can be no question of the great material, and still more of the moral, effects of aircraft bombs, and it is their unenviable peculiarity that non-combatants are nearly as qualified as combatants to pronounce an opinion upon them in this connection.

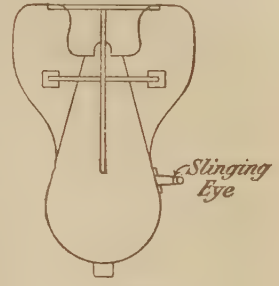


Fig. 8.

Depth Charges.—These are steel cylinders containing a large charge of high explosive for use against submarines. They are carried slung over the sterns of vessels told off for anti-submarine work, and can be dropped instantly upon the ascertained, or supposed, position of a submarine; they are provided with special fuses which explode the charge when it has sunk to a certain depth; they are wholly products of the war of 1914-18, and date actually from 1916. They have been very successful. See GRENADE, SHELL, MORTAR, INFERNAL MACHINES, MACHINE GUN.

Bomb, in Geology, a more or less rounded lump of rock, often hollow, believed to have solidified from a whirling mass of molten material thrown out by a volcano. Some bombs, however, seem to have formed in a lava-stream, without having travelled through the air.

Bomba was an opprobrious nickname bestowed on Ferdinand II. of Naples (1810-59), in consequence of his cruel bombardment of Naples, Messina, and other cities of his realm during the revolutionary troubles of 1849.

Bombacaceæ, or BOMBACEÆ, a family of dicotyledons, allied to Malvaceæ (q.v.), with which some unite it. The twenty genera, of over a hundred species, are mainly tropical American, but some are found in Asia, Africa, and Australia. The family includes several well-known and important trees, often of great size and fantastic form of trunk,

egg-shaped or bottle-shaped, owing to the presence of much water-storing tissue. The chief genera are *Adansonia* (see *BAOBAB*), *Durio* (see *DURIAN*), *Bombax*, and *Eriodendron*. For kapok, the floss obtained from the two last-named, see *SILK-COTTON*.

Bombard, a kind of cannon in use about the close of the 14th century and later, short, thick, and wide in the bore, sometimes capable of throwing balls of stone of 200 and even 500 lb. weight.

Bombardier, the lowest non-commissioned officer in the British artillery, ranking with corporals in the infantry and cavalry. The name was applied in the 17th and 18th centuries to a man employed about the mortars and howitzers—pieces of ordnance used in bombarding.

Bombardier Beetle, a name given to several beetles, of the genera *Brachinus* and *Aptinus*, in the sub-family *Carabidae*, refers to their offensive and defensive habit of discharging an acrid volatile fluid with explosive force from the abdomen. Some ants and other insects exhibit the same device. The discharge has a pungent odour, acid and caustic properties, and evaporates with effervescence in the air. These beetles are usually found under stones or at tree-roots, often in great companies. The larger and more brilliant species are tropical. Several are British.

Bombardment is an attack upon a fortress or fortified town by means of shells and incendiary bombs, thrown by guns or from aircraft, to destroy the fortifications, burn the houses, and kill the people. It is most likely to be successful against a place destitute of bombproof cover, or one having a large civil population. A bombardment is a cruel operation, especially when, as is often the case, it is directed against the civilians and their buildings, as a means of inducing or compelling the governor to surrender the place and terminate their miseries. It requires little engineering science; whereas a regular siege, which is a much slower process, requires the aid of engineers to direct the attack against fortifications, guns, and soldiery, leaving the inhabitants and buildings untouched. In modern times a bombardment is generally adopted as an adjunct to a siege, distracting the garrison by an incessant fire from mortars and heavy guns day and night. At Sebastopol, for instance, the mortars fired shells into the centre of the city, while the forts were cannonaded by the siege-guns. Bombardment of a town was, by international agreement, illegal, unless the town was being defended by hostile troops, but the law was frequently broken on various pretexts in the Great War. The stores required for a vigorous bombardment are immense. In January 1871 the Germans, bombarding Paris and its forts, threw 10,000 shells daily into the place, of which 500 fell in the city itself. The siege and bombardment of Strasburg is also memorable. At Port Arthur the Japanese threw half-a-million shells into the place in six months. In the Great War siege artillery proved superior to all the permanent fortifications, and the usual method of gaining any place, be it fort or town or village or group of field-works, was to beat it flat with high-explosive shells.

Bombardon, in Music. See *SAXHORN*.

Bombastes Furioso, a burlesque of *Orlando Furioso* produced in 1810 by William Barnes Rhodes (1772-1826), chief teller of the Bank of England.

Bombax. See *SILK-COTTON*.

Bombay, a western province of India, with a Governor appointed by the crown, an Executive and a Legislative Council. Bombay, including Sind, comprises 29 British districts, and about 350 native or feudatory states, divided for adminis-

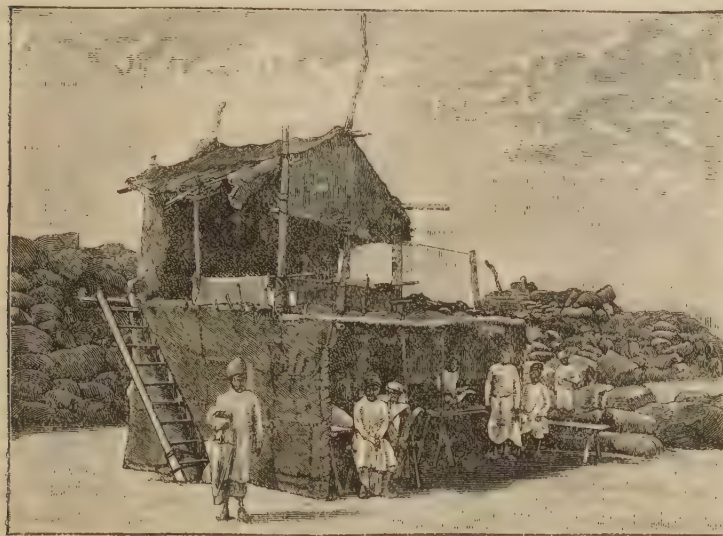
trative purposes into 18 agencies, and contains 186,923 sq. m., of which 63,864 are in native states. The Nerbudda River divides the presidency, as in accordance with the old name it is still often called (see *INDIA*), into two portions: in the north is Guzerat, chiefly consisting of alluvial plains, with the Cutch and Kathiawar peninsulas; to the south is the Mahratta country, which includes parts of the Deccan, Carnatic, and Konkan or coast-districts. The political control of Baroda (q.v.) was transferred in 1875 from Bombay to the supreme government of India. The small territories of the Portuguese—Goa, Daman, and Diu—have an area of 1638 sq. m. The coast-line is irregular, broken by the gulfs of Cambay and Cutch, with several fine natural harbours, Bombay and Karachi (Kurrachee) being the most important. The chief mountain-ranges run north and south; in the north are the Khirthar Mountains; in the south-east are the Western Aravalli range; south of the Tapti are the Sahyadri Mountains or Western Ghâts, which run almost parallel with the coast; the Satpura range runs east, and forms the watershed between the Tapti and Nerbudda. Sind is watered and fertilised throughout its whole length by the Indus; the Subarmati and Mahi flow through the plains of North Guzerat; the Nerbudda pursues a western course into the Gulf of Cambay. The Tapti flows through Khandesh district, entering the sea above Surat. Besides these, there are numerous hill streams, which are torrents during the rains and dry up in the hot season. The Runn of Cutch (q.v.), in the west of Guzerat, covers an area of about 8000 sq. m., and is the great source of salt-supply for the presidency. There are few minerals, and no coal; iron is mined at Teagar in Dharvar, and there is gold amongst the quartz. Good building-stone is abundant, with limestone and slate. In the dry sandy districts of Sind the thermometer has reached 130° in the shade; the mean temperature in Lower Sind during the hottest months is 98° in the shade. In Cutch and Guzerat the heat is slightly less. The average rainfall is 70 inches. The coast-districts are hot and moist, with a heavy rainfall. The tableland of the Deccan has an agreeable climate, except during the hot months.

The principal agricultural products are millet, legumes, rice, wheat, cotton, oil-seeds, tobacco, indigo, cane-sugar, &c. Marathi and Canarese are spoken in the south, Gujarati in the north-west, Sindi in Sind, and west of the Indus Baluchi. For the government of the presidency, see *INDIA*. Bombay is the headquarters of an Anglican bishop appointed by the crown, and of a Roman Catholic archbishop. During the Mutiny of 1857 the local army remained, on the whole, faithful. Poona is the military centre. Bombay has benefited vastly from the establishment and extension of the Indian railway-system. The first railway in India was opened in Bombay in 1853; the presidency has now more than 4000 miles of railway, giving communication with all the important towns of India. A telegraph cable from Bombay to Aden was laid in 1869; there are now private company cables, while the Government Indo-European Telegraph Department has its headquarters at Karachi.

Of late years manufacturing industries have been extremely active in Bombay. Commanding the richest cotton-fields in India, it has improved to the utmost its natural advantages. The stoppage of the American cotton-supply during the Civil War gave a great impulse to the trade, and the wealth poured into Bombay at this period led to a vast extension of the trade, which partly continued after the period of inflation had passed. The first mill was started in 1854. There is still a large import of cotton goods from

England, but though the Indian cotton trade has often been greatly depressed, Bombay not merely

towards Mazagaon, are traversed by fairly wide streets, extensive lines of tramways passing through even the most crowded parts. Many of the private houses of European residents are built on the suburb of Malabar Hill, the ridge running into the sea forming the west of Back Bay, and at Breach Candy looking seaward. The Hindus and the Mohammedans form the largest section of the population, and the rest are Parsees, native Christians, Europeans, Indo-Portuguese, Jews, &c. Amid these various classes, the Parsees rank next to the English in position and influence. Among their leaders may be named Sir Jamsetjee Jeejeebhoy and Sir Dinshaw Manojjee Petit, merchant-princes who endowed Bombay with magnificent charities. The Banias, or Hindu traders, rank next to the Parsees. On the esplanade, facing



Cotton Merchants at Bombay.

competes with Manchester in the Indian markets, but largely exports its own manufactures. The town of Bombay is naturally the chief centre of the cotton manufacture, as it is the place whence cotton and cotton goods are exported. For Indian cotton-growing and cotton-manufacturing, see also COTTON. The rapid growth and present condition of the cotton industry is the more striking in view of the abolition in 1881 of the duty on cotton imports, which placed the local industry at a disadvantage. These duties were reimposed at a later date. After cotton, the other great staples are wheat and seeds. The trade in Bombay opium, which is manufactured in the native states, is now much smaller and diminishing. Although of recent origin, the wheat trade has assumed large proportions. Other principal exports are sugar, tea, raw wool, woollen shawls, fibres, and drugs; while among the imports are machinery, metals, oils, coal, and liquors. Silk-weaving is carried on at Ahmedabad, Surat, Nasik, Yeola, and Poona; carpets are made at Ahmednagar; leather-work and pottery in Sind; brassware in Bombay city, Nasik, and Poona; cutlery, armour, and gold and silver work in Cutch.

The population of the presidency (including Sind) in 1921 was in the native states 7,412,341, and in British territory 19,283,663. Nearly four-fifths are Hindus, nearly one-sixth Mohammedans, the remainder being Jains and aboriginals, with a quarter of a million Christians.

Bombay (City) occupies the entire breadth of the SE. end of Bombay Island or Peninsula, bordering at once on the harbour inside, and on Back Bay outside. The island, now permanently connected by causeways and breakwaters with Salsette Island and the mainland, is over 11 miles long by from 3 to 4 broad. For administrative purposes the city constitutes a district by itself, with an area of 22 sq. m. Its harbour, studded with islands and crowded with shipping, is one of the finest in the world, the space available for shipping being about 14 miles by 5. Bombay is the most European in appearance of all the cities in India. In the business part there are several streets continuously lined with splendid buildings; while the bazaars, which extend from the fort

towards Back Bay, are the secretariat, the university (founded 1887), senate-hall, high court, offices of public works, sailors' home, and statue of Queen Victoria. In the neighbourhood of the fort are the town-hall, the mint, cathedral, and custom-house. The terminus of the Great Indian Peninsular Railway, opened in 1876, is the finest building in Bombay—probably the finest structure



of the kind in the world. On the promontory to the east of Back Bay stood the old fort, now a mere garrison, its walls having been demolished; the harbour is defended by batteries. It has an extensive system of quays, wharves, and docks, including Prince's Dock (1879) and Victoria Dock (1889). Extensions made in 1905-14 include some miles of deep-water quays, with railways and depots constructed upon a square mile of reclaimed land, a great dry-dock (1000 feet by 100), and the Alexandra wet-dock (nearly 50 acres' water-area). These improvements provide accommodation for the largest ships likely to pass through the

Suez Canal, and greatly simplify the handling of goods. Mazagaon Bay, the centre of shipping activity, is at the head of the harbour. The city water-supply is, since 1892, drawn from Tansa Lake (q.v.), 65 miles N. Always favourably situated for foreign trade, Bombay has profited largely by being the first important port reached by vessels from Europe. It formerly surpassed Calcutta in amount of trade, but in the 20th century Calcutta's foreign trade has been greater than Bombay's. The chief exports are cotton, wheat, shawls, opium, coffee, pepper, ivory, and gums; the chief imports, piece-goods, thread, yarn, metals, wine, beer, tea, and silk. Manufactures are increasing. In 1910 a company was formed to bring electric-power generated at vast reservoirs in the Western Ghats. Pop. (1901) 770,843; (1910) 979,445; (1921) 1,172,953.

In 1509, about a year before the capture of Goa, the Portuguese visited the island; and by 1532 they had made it their own. In 1661 they ceded it to Charles II. of England, as part of the dowry of his bride, the Infanta Catharine. In 1668 his majesty granted it for an annual payment of £10 to the East India Company, which, in 1685, transferred what was then its principal presidency to Bombay from Surat. The name of the island, styled Maimbi by the Portuguese of the 16th century, is said to be derived from the goddess Mumba-devi; Colonel Yule has traced it back to Mayamba, the name of the Konkan kingdom in the 16th century. The bay towards the mainland is one of the finest havens in India. Among the numerous islands are Elephanta (q.v.) and Salsette. An appalling and continued visitation of the bubonic plague killed 23,418 persons in 139 days of 1896-97, 28,869 in 115 days of 1898, 31,260 in 131 days of 1899, and 50,383 between November 1899 and April 1900. Vast numbers of the inhabitants fled from the city, and trade and commerce were wholly disorganised. Bombay is the birth-place of Jejeebhoy, Monier Williams, Dean Farrar, and Rudyard Kipling.

See books by Maclean (1876), Eastwick (1881), Hunter (1892), James Douglas (1900), and Malabari (1910).

Bombay Duck, or BUMMALOTI (*Saurus ophiodon*), a fish of the family Scopolidae, nearly allied to the salmon and trout family. It is a small but voracious fish of elongated form, with large fins and a very large mouth, the gape of which extends far behind the eyes, and which is furnished with a great number of long, slender teeth, barbed at the points. It is a native of the coasts of India, particularly of the Bombay and Malabar regions, from which it is exported in large quantities, salted and dried, to other parts of India and elsewhere, being highly esteemed for its rich flavour, and often used as a relish.

Bombazine is a cloth for dresses, in which the distinguishing characteristic is that the warp is silk and the weft worsted. The cloth has thus a bare look. It is rather fine and light in the make, and may be of any colour. The fabric is now little used. It was extensively made, and chiefly at Norwich, from about 1816.

Bomb-proofs are military structures of such immense thickness and strength that shells cannot penetrate them. In every fort, the barracks, hospital, stores, and magazines are covered with masonry and earth, or even, in some cases, with thick armour-plates, in order to be impervious to the fire of the siege-guns and mortars. See CASE-MATE, and MAGAZINE.

Bombyx. See SILK.

Bommel, a town in the Dutch province of Gelderland, on the Waal, 20 miles SSE. of Utrecht; population, 5000.—The Bommelerwaard is a fertile

island-district (16 by 6 miles), formed by the Waal and Maas.

Bona (Fr. *Bône*), a seaport town of Algeria, in the province of Constantine, situated on a bay of the Mediterranean, near the mouth of the Sebus, 220 miles W. of Tunis by rail. The town, divided into two parts, Upper and Lower Bona, is situated in a beautiful but unhealthy district at the foot of a hill, and is defended by a citadel and several forts. Since the occupation of Bona by the French in 1832, the town has been much improved, and has good bazaars, shops, markets, reading-rooms, &c.; manufactures of tapestry, saddlery, and native clothing; and a trade in phosphates, metals, wool, hides, corn, coral, and wax. The exposed roadstead has been made into a fair harbour. There are iron and copper mines near Bona. A telegraph cable was laid between Bona and Marseilles in 1870. Among the public buildings, the Catholic church and the convent of the Sisters of Mercy are most remarkable. Near Bona are some scanty remains of the once famous city, Hippo Regius, a centre of commerce and civilisation in North Africa destroyed by Khalif Osman in 646, the favourite residence of the Numidian kings, and the episcopal seat of St Augustine, who died here in 430. Conspicuous on a hill-top above the site of Hippo is the great basilica of St Augustine, inaugurated in April 1900. Pop. 45,000.

Bona is law-Latin for goods, and occurs in the Scottish legal phrase *in bonis*—i.e. forming part of the legal estate—and in the Roman phrase *bonorum possessio*. In English law the word has some technical applications: *Bona Vacantia*—such as wrecks, treasure-trove, waifs, and estrays, contrary to the general rule, which gives such things to the finder—vest in the crown; *Bona Wariata* consist of goods waived or thrown away by a thief in his flight, for fear of being apprehended; they belong to the owner if he prosecutes to conviction, otherwise to the crown. In cases of outlawry, the property forfeited to the crown is sometimes called *Bona Confiscata*.

Bona Dea ('the good goddess'), a mysterious Italian goddess of fertility, who is variously described as the wife, sister, or daughter of Faunus. She was worshipped at Rome from the most ancient times, but only by women, even her name being concealed from men. Her sanctuary was a grotto on Mons Aventinus; but her festival (the 1st of May) was celebrated in the house of the consul. The solemnities were performed generally by high-born vestals. At this celebration, no males were allowed to be present; even portraits of men were veiled. During the celebration in the house of Cæsar (62 B.C.), the infamous Clodius was discovered disguised as a female musician. The symbol of the goddess was a serpent, indicating her healing powers.

Bona Fides, a Latin expression signifying good faith, enters as a legal doctrine largely into the consideration of matters of agreement, contract, damage, trusts, and other departments of the law; and in all of them it requires the absence of fraud, or unfair dealing. This term, however, does not appear to occupy any formal or technical place in the law of England. It is the foundation of many just and enlightened maxims in the Roman jurisprudence, which in this respect, as in many others, has been followed by the legal system of Scotland. In the law of that country, a person who possesses and enjoys property upon a title which he honestly believes to be good, although it may be bad, is protected against the consequences of this illegal position, and he is entitled to retain the fruits or profits which he has reaped or received during his *bona-fide* occupancy. But

this protection ends when the possessor becomes aware of the insufficiency of his title, whether by private knowledge or otherwise. This rule, which is largely founded on the negligence of the true owner, would extend to a claim for interest on money erroneously paid to a person honestly believing himself the creditor. In the Scots law, again, while honest belief will not render valid a second marriage, the first subsisting, it would, it is thought, have the effect of rendering the children of such second or putative marriage *legitimate*, and would even confer rights of succession on the innocent husband or wife. The law of England is not so indulgent, for there children born under such circumstances would certainly be deemed bastards. As a general rule, parties are supposed to contract at arm's length, and therefore there is not much room for the doctrine of *bona fides* in considering business agreements, which depend on the true construction of the documents exchanged. Positive misrepresentation or fraud will of course upset a contract if it led to error, but it is only in certain classes of contracts, such as partnership, suretyship, insurance, &c., that the plea of undue concealment has much force. The amount of damages recovered is sometimes affected by the good or bad faith of the wrongdoer, as in the case of wilful trespass of mining boundaries, where the nature of the subject renders a severe check necessary. In trust administration the beneficiaries are entitled to place much confidence in the trustees, and bad faith on their part is severely dealt with. See **BASTARDS**, **BASTARDY**; and see on the subject of this article generally, **CONTRACT**, **DAMAGE**, **EXECUTOR**, **GUARDIAN**, **MARRIAGE**, **TRUSTEE**.

The interpretation of the term *Bona-fide Traveller* has given no little trouble to the magistrates of Scotland in reference to the famous 'Forbes Mackenzie Act' (q.v.).

Bonaire. See **BUEN AIRE**.

Bonald, LOUIS GABRIEL AMBROISE, VICOMTE DE, a French publicist, born in 1753 at Monna, in Aveyron, was compelled to emigrate during the French Revolution, and employed his pen at Heidelberg on behalf of monarchy. His first important work, *Théorie du Pouvoir Politique et Religieux* (3 vols. 1796), was seized by the Directory. It prophesied the restoration of the Bourbons. Having returned to France, he was in 1808 appointed by Napoleon Minister of Instruction. In 1815 he voted with the Ultramontane party, and ever after displayed a marked hostility to the freedom of the press, and all projects of electoral reform. Raised to the peerage by Louis XVIII. in 1823, he retired, under the next dynasty, to Monna, where he died 23d November 1840. His most important writings are: *Législation Primitive* (3 vols. 1802), and *Recherches Philosophiques* (2 vols. 1818), which have been immensely applauded by his own party, but are most remarkable for weak logic, historical inaccuracy, and unreasonable devotion to the pope and the Jesuits. A complete edition of his works in 12 volumes was published under his own supervision (1817-19).—His son, LOUIS JACQUES MAURICE (1787-1870), became Archbishop of Lyons in 1839, and a cardinal in 1841.

Bonanza (Span., 'a fair wind,' 'prosperity'), a term originally applied in the mining territories of the United States to the discovery of a rich vein or 'pocket'; a mine was said to be in *bonanza* when producing profitable ore. It has since been used colloquially of farms where steam is employed, or of successful enterprises generally, in the sense of a 'mine of wealth.'

Bonaparte (pronounced in Ital. in four syllables; in Fr. and Eng. in three) is the name of a

famous family, and was spelt *Buonaparte* by the Emperor Napoleon and his father till 1796, though the more usual modern form also occurs in old Italian documents. In the 13th century and afterwards, several families named Bonaparte figure with distinction in Italian records—at Florence, San Miniato, Sarzano, and Genoa. But as the name of Bonaparte occurs in Corsica so early as the 10th century, it is probable that the island may have been their original home. In the 16th century we again find mention of the Bonapartes in Corsica, where in Ajaccio they occupied a respectable position as a patrician or leading family. In the 18th century this family was represented by three male descendants, all residing at Ajaccio: the archdeacon, Lucien Bonaparte; his brother, Napoleon Bonaparte; and their nephew, Charles.—CHARLES BONAPARTE, father of the Emperor Napoleon, was born at Ajaccio in 1746; studied law at Pisa; and married in 1767—without the consent of his uncles—a beautiful young patrician lady, named Letizia Ramolino. In 1768 he removed with his family to Corte, in order to assist General Paoli in defending the island against the French invasion. As the French prevailed, and further resistance was useless, Charles Bonaparte attached himself to the French interest, and in 1771 was included by Louis XV. in the election of 400 Corsican families to form a nobility. In 1773 Charles Bonaparte was appointed royal counsellor and assessor of the town and province of Ajaccio. In 1777 he was a member of the deputation of Corsican nobles to the court of France. In this capacity he resided for some time in Paris, where he gained for his son Napoleon, through the interest of Count Marboeuf, a free admission into the military school at Brienne. In 1779 he returned to Corsica, and in 1785 went to Montpellier for the benefit of his health, where he died the same year. He was a man of noble presence and amiable character. By his marriage with Letizia he left eight children: Joseph Bonaparte, king of Spain; Napoleon (q.v.), emperor of the French; Lucien Bonaparte, Prince of Canino; Marianne Elisa, Princess of Lucca and Piombino, wife of Prince Bacciocchi; Louis Bonaparte, king of Holland; Marie Pauline, married at seventeen to General Leclerc (who died of yellow fever in the West Indies), afterwards Princess Borghese; Maria Annunziata Caroline, who married Murat, king of Naples; Jerome Bonaparte, king of Westphalia. These members of the Bonaparte family, with the children of Beauharnais (q.v.), adopted by the Emperor Napoleon when he married Josephine, are distinguished as the *Napoleonide* of modern French history. By a decree of the Senate (1804), the right of succession to the throne was restricted to Napoleon and his brothers Joseph and Louis, with their offspring. Lucien and Jerome were excluded on account of their unequal marriages. As Joseph, the eldest brother of the emperor, had no son, the descendants of Louis became nearest heirs to the throne.—MARIA LETIZIA RAMOLINO, mother of Napoleon I., lived to see her family placed on the thrones of Europe, and also witnessed their downfall. She was born at Ajaccio in 1750. After the death of her husband she lived for some time in Corsica, and in 1793, when the island came under British rule, removed with her family to Marseilles, where she lived in poverty, mainly supported by the pension given to Corsican refugees. After her son became First Consul she removed to Paris, and when her son was crowned in 1804 received the title Madame Mère, and was made patroness of all the benevolent institutions of the empire. A brilliant court-household was given to her, which, however, was never pleasing to her modest tastes.

Remembering former adversities, and foreboding reverses of the splendid success of her sons, she was prepared for all that followed. After the downfall of Napoleon, Letizia lived with her step-brother, Cardinal Fesch, in winter at Rome, and in summer at Albano, and submitted to her change of fortune with remarkable dignity. She died in 1836, leaving a considerable property, the result of saving habits during her prosperity.

JOSEPH BONAPARTE, eldest brother of Napoleon, was born at Corte, in Corsica, in 1768. On the death of his father he exerted himself to support the younger members of the family, and in 1792 removed with them to Marseilles, where he prepared for the bar. In 1797 he was elected a member of the Council of Five Hundred, and in the same year was sent as ambassador from the republic to Rome. In 1800, after he had proved his ability in several offices of state, he was chosen by the First Consul as plenipotentiary to conclude a treaty of friendship with the United States of America. He signed the treaty of peace at Luneville 1801, and that of Amiens 1802; and with Cretet and Bernier conducted the negotiations relative to the *concordat*. After the coronation of Napoleon new honours fell to the share of Joseph Bonaparte, who was made commander-in-chief of the army of Naples; in 1805, ruler of the Two Sicilies; and in 1806, king of Naples. Though, during his reign, many beneficial changes of government were effected, these reforms were not managed judiciously; and his humane feelings brought him into frequent collision with his imperious brother, a fact which did not conduce to the efficiency of his rule. In truth, he was far too fond of the fine arts to be a vigorous ruler in stormy times; and he is accused of leaving affairs too much in the hands of his minister, the subtle Salicetti. In 1808 Joseph Bonaparte was summarily transferred by his brother to the throne of Spain, and Murat took his place as king of Naples. For Joseph, this was no favourable change; he found himself unprepared to cope with the Spanish insurgents, and after the defeat of the French at Vittoria in 1813, he returned to his estate at Morfontaine, in France.

After the battle of Waterloo he accompanied Napoleon to Rochefort, whence they intended to sail separately for North America. In his last interview with Napoleon, Joseph generously offered to give up the vessel hired for his own escape, but meanwhile Napoleon had determined to surrender himself into the hands of the English. Joseph became an American citizen, and lived for some years at Bordentown, in New Jersey, U.S., where he employed himself in agriculture, and was highly esteemed by his neighbours. In 1832 he returned to Europe, and he died at Florence in 1844. Joseph was the only one of his brothers for whom Napoleon professed to care anything. He was a handsome, intelligent-looking man, distinguished by the elegance of his manners and conversation.—His wife, JULIA MARIE CLARY, born 1777, was the daughter of a wealthy citizen of Marseilles, and the sister-in-law of Bernadotte, king of Sweden. She was a quiet unambitious woman, with no taste for the splendours of royalty which fell to her share during a few weeks only at Naples, for she never went to Spain. Ill-health appears to have prevented her accompanying her husband to America. She died at Florence in 1845. By her marriage with Joseph Bonaparte she had two daughters.

LUCIEN BONAPARTE, Prince of Canino, and brother of Napoleon, was born at Ajaccio in 1775, and received his education in the college of Autun, the military school at Brienne, and the seminary at Aix. In 1798 he was made a member of the

Council of Five Hundred, and formed a party favourable to the views of his brother Napoleon. Shortly before the 18th Brumaire he was elected president of the Council of Five Hundred, and was the hero of that day. During the ferment which followed Napoleon's entrance, Lucien left his seat, mounted his horse, and riding through the ranks of the assembled troops, called upon them to rescue their general from assassins. Afterwards appointed Minister of the Interior, he was active in the encouragement of education, art, and science, and organised the prefectures. As ambassador to Madrid (1800) he contrived to gain the confidence of King Charles IV. and his favourite Godoy, and to undermine the British influence, which had until then been exercised at the court of Spain. Lucien was a republican in opinion, and therefore opposed to the absolute rule of his brother; and his second marriage to the widow of a stockbroker did not improve their relations. On condition that he would divorce his wife, the crowns of Italy and Spain were offered him; but he refused them, and preferred living in retirement at his estate of Canino, in the province of Viterbo, near the frontiers of Tuscany, where he devoted his time to art and science. Here he enjoyed the friendship of the pope, who created him Prince of Canino and Musignano; but having denounced in his private capacity the arrogant and cruel policy of his brother towards the court of Rome, he was 'advised' to leave the city in which he was at that period residing. In 1810 he took ship for America, but fell into the hands of the English. After the defeat at Waterloo, Lucien Bonaparte alone seems to have preserved his presence of mind. He immediately advised his brother to dissolve the chambers, and assume the place of absolute dictator. After the second ascent of the throne by Louis XVIII., Lucien lived in and near Rome, and died at Viterbo in 1840. He possessed considerable talents and firmness of character. He was in his early years a keen republican, but the weakness of the Directory convinced him that a military consulship was necessary to allay the social anarchy of France. He wrote poems of no particular merit. Lucien had a numerous family. By his first wife he had only two daughters. See Jung, *Lucien Bonaparte et ses Mémoires* (3 vols. 1882-83).

His eldest son was CHARLES LUCIEN JULES LAURENT BONAPARTE, Prince of Canino and Musignano, born at Paris in 1803. He never exhibited any inclination for political life, preferring the more quiet and wholesome pursuits of literature and science. He acquired a considerable reputation as a naturalist, and especially as a writer on ornithology. He died in 1857. He was a member of the principal academies of Europe and America. His chief publications are a continuation of Wilson's *Ornithology of America*, and the *Iconografia della Fauna Italiana*.—The second son, PAUL MARIE BONAPARTE, born in 1808, took a part in the Greek war of liberation, and died by the accidental discharge of a pistol in 1827.—The third son, LOUIS LUCIEN BONAPARTE, born in 1813, at Thorn Grove, Worcestershire, during his father's imprisonment in England, early devoted himself with equal ardour to chemistry, mineralogy, and the study of languages, and became an authority of the first rank in Basque, Celtic, and comparative philology generally. His election for Corsica in 1848 was annulled, but he was sent to the Constituent Assembly for the Seine department next year, and was made senator in 1852, with the title of highness in addition to that of prince which he already possessed from his birth. Most of his contributions to linguistic science have been privately printed, and, according to a *Catalogue* (8 parts, 1858-88), the total number of separate

books written either by himself or at his instigation and encouragement, amounted to no less than two hundred and twenty-two. Amongst these are a translation of St Matthew's version of the parable of the sower into seventy-two languages and dialects of Europe (1857); a linguistic map of the seven Basque provinces, showing the delimitation of the 'Euscara' and its division into dialects, sub-dialects, and varieties (1863); a Basque version of the Bible in the Labourdin dialect (1865); a masterly treatise on the Basque verb (1869); besides many papers in the philological journals. Under his patronage from 1858 to 1860 a version of the Song of Solomon was produced in twenty-two English dialects, besides four in Lowland Scotch. For long he lived in England, where a Civil List pension of £250 was granted to him in 1883. He died at Fano, on the Adriatic, 3d November 1891.—The fourth son, PIERRE NAPOLEON BONAPARTE, born in 1815, passed through many changes of fortune in America, Italy, and Belgium, and returned to France in 1848. In 1870 he shot a journalist, Victor Noir, a deed which created great excitement in Paris; and being tried, was acquitted of the charge of murder, but condemned to pay £1000 to Victor Noir's relatives. He died in 1881.—The youngest son, ANTOINE BONAPARTE, born in 1816, fled to America after an affair with the papal troops in 1836, and returned to France in 1848, where he was elected to the National Assembly in 1849; he died in 1883.

LOUIS BONAPARTE, third brother of Napoleon, born in 1778, was educated in the artillery school at Châlons, where he imbibed anti-republican principles. After rising from one honour to another he was made king of Holland in 1806; but, in fact, was never more than a French governor of Holland, subordinate to the will of his brother. Yet he seems to have done his best to govern in the interests of his Dutch subjects, and when he found his efforts useless, he resigned in favour of his son in 1810. He returned to Paris in 1814, where he was coldly received by the emperor. After living for some years in Rome—where he separated from his wife—he removed in 1826 to Florence, where he lived in retirement. He died at Leghorn in 1846. Louis Bonaparte was the writer of several works: *Marie, ou les Hollandaises* (1814), a novel, giving sketches of Dutch manners; *Documents Historiques, &c. sur le Gouvernement de la Hollande* (3 vols. Lond. 1821); *Histoire du Parlement Anglais* (1820); and a critique on M. de Norvins's *History of Napoleon*. Louis Bonaparte was married in 1802 to Hortense Beauharnais, daughter of General Beauharnais (q.v.) by his wife Josephine, afterwards empress of the French.

The amiable and accomplished HORTENSE EUGÉNIE BEAUHARNAIS, the adopted daughter of Napoleon, queen of Holland and Countess St Leu, was born at Paris in 1783. After the execution of her father, she lived for some time in humble circumstances, until Napoleon's marriage with Josephine. In obedience to the plans of her step-father she rejected her intended husband, General Desaix, and married Louis Bonaparte in 1802. She lived mostly apart from her husband, even as queen of Holland; and on the downfall of the Napoleons, passed her time in various countries. She at last settled at Arenenberg, a mansion in the canton Thurgau, Switzerland, where she lived in retirement, sometimes spending a winter in Italy. In 1831, when her two sons had implicated themselves in the Italian insurrection, the countess travelled in search of them through many dangers, and found the elder deceased, and the younger, the late emperor of the French, ill at a place near Ancona. She died at Arenen-

berg in 1837, and was buried near the remains of her mother, Josephine, at Ruel, near Paris. She was the authoress of *La Reine Hortense en Italie, en France, et en Angleterre, pendant l'année 1831*, and wrote several excellent songs. She likewise composed some deservedly popular airs; among others the well-known *Partant pour la Syrie*, which the late emperor of the French, with a delicate union of political tact and filial pride, made the national air of France. Of her three sons, the eldest, NAPOLEON LOUIS CHARLES, born 1803, died in childhood in 1807.—The second, LOUIS NAPOLEON, born 1804, crown prince of Holland, married his cousin Charlotte, daughter of Joseph Bonaparte, and died in 1831.—The third, CHARLES LOUIS NAPOLEON, became emperor of the French. See NAPOLEON III.

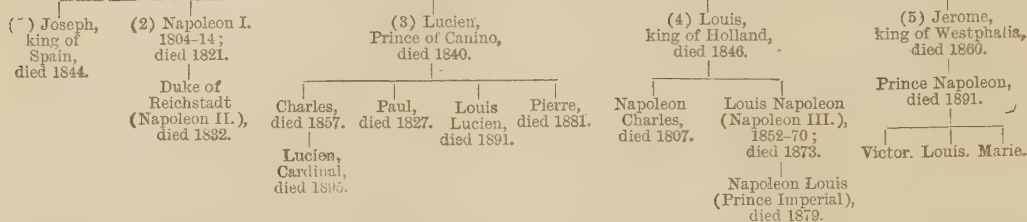
JEROME BONAPARTE, youngest brother of Napoleon, was born at Ajaccio in 1784. After receiving his education in the college at Juilly, he served as naval lieutenant in the expedition to Hayti. When war broke out between France and England in 1803, Jerome was visiting Martinique. Refusing to return to Europe, he proceeded to Washington and Baltimore. While in America he married Elizabeth Patterson (1785–1879), daughter of a merchant in Baltimore. He fought in the war against Prussia, and in 1807 was made king of Westphalia. His administration of his kingdom was careless, extravagant, and burdensome to his subjects. The battle of Leipzig brought the reign of Jerome to a close. He fought by the side of the emperor at Waterloo. After his brother's abdication he left Paris and visited Switzerland and Austria, but ultimately settled in Florence. At the outbreak of the February revolution (1848) Jerome Bonaparte was in Paris, where he was appointed governor of the Invalides, and in 1850 was made a French marshal. He died in 1860.

His marriage with Elizabeth Patterson having been declared null by Napoleon, a marriage with Catherine, daughter of King Frederick I. of Württemberg, was arranged as a prelude to the creation of the kingdom of Westphalia. After Waterloo, her father wished to annul it; but she declared her resolution to share through life the fortunes of her husband. Jerome Bonaparte had by his first marriage one son, Jerome Napoleon (1805–70), a wealthy American citizen, father of Roosevelt's attorney-general, the Hon. Charles Bonaparte (1851–1921). By his second wife he had three children.—The elder son, JEROME BONAPARTE, born 1814, died in 1847.—MATHILDE BONAPARTE, Princess of Montfort (1820–1904), born at Trieste, married the Russian Count Anatol Demidov, and lived at the court of Louis Napoleon during his presidency.—The younger son, NAPOLEON JOSEPH CHARLES PAUL BONAPARTE, born at Trieste in 1822, passed his youth in Italy; entered the military service of Württemberg in 1837; afterwards travelled in several countries of Europe; and was banished from France (1845) on account of his intercourse with the Republican party. After February 1848 he was elected into the Legislative National Assembly. He commanded an infantry division at the battles of Alma and Inkermann. In 1859 he married the Princess Clotilde, daughter of Victor Emmanuel, by whom he had two sons and a daughter. After the fall of the empire he took up his residence in England, but returned to France in 1872. On the death of the Prince Imperial, son of the Emperor Louis Napoleon, in Zululand in 1879, the eldest son of Prince Napoleon became the heir of the Bonapartist hopes. When, in 1886, the chiefs of the Bourbon family were expelled from France, Prince Napoleon and his eldest son were exiled also as pretenders to the throne. He died at Rome, 17th March 1891. See

NAPOLÉON, NAPOLÉON III., MORNAY, and works cited at those articles: books on the Bonapartes, by Wouters, Gregorovius (trans. 1855), Leynadier, Du Casse, Williams and Lester; the Memoirs of

Lucien and Jerome; Larrey, *Madame Mère* (1892); Bingham, *The Marriages of the Bonapartes* (1881); H. Atteridge, *Napoleon's Brothers* (1909); I. A. Taylor, *Queen Hortense and her Friends* (1907).

Charles Bonaparte.



Bonar, HORATIUS, born in Edinburgh, 19th December 1808, and educated at the High School and university there, was in 1837 ordained at Kelso, where at first as parish minister, and after 1843 as minister of the Free Church, he remained for nearly thirty years, when he was translated to a Free church in Edinburgh. For a time editor of the *Christian Treasury* and other religious serials, he published besides some twenty volumes of sermons, devotional and biblical works. He is known to all English-speaking Christians as a hymn-writer—one of the very few Scottish authors whose hymns have found wide acceptance. Some of his *Hymns of Faith and Hope* (three series, 1857-66) are wonderfully perfect religious poems; and not a few are found in most collections in Britain, America, and the Colonies, such as 'I lay my sins on Jesus,' 'I heard the voice of Jesus say,' 'Thy way, not mine, O Lord,' 'A few more years shall roll.' He died 31st July 1889, and a *Memorial* was published the same year.

Bonasia, a genus or sub-genus of the Grouse family; see GROUSE.

Bonasmus, or BONASSUS. See BISON.

Bonaventura, ST, one of the most eminent Catholic theologians, whose real name was John of Fidenza, was born in 1221 at Bagnarea, in Tuscany. In 1243 he became a Franciscan monk; in 1253 a theological teacher at Paris, where he had studied; and in 1256 general of his order, which he governed strictly, but affectionately. His influence reconciled the differences which had sprung up among the cardinals on the death of Clement IV. in 1268, and procured the election of Gregory X. The new pope created him Bishop of Albano and cardinal in 1273, and insisted on his presence at the Council of Lyons, where he died, July 15, 1274, from sheer ascetic exhaustion. He was honoured with a splendid funeral, which was attended by the pope, the king, and all the cardinals.

On account of his unspotted character from earliest youth, as well as the miracles ascribed to him, he enjoyed, even during his lifetime, especial veneration. Dante, who wrote shortly after, places him among the saints of his *Paradiso*; in 1482 he was formally canonised by Sixtus IV.; and in 1587 was ranked by Sixtus V. as the sixth of the great doctors of the church. The religious fervour of his style procured for him the title of *Doctor Seraphicus*, and his own order are as proud of him as the Dominicans are of Thomas Aquinas. A great part of his writings is devoted to the praise of his order, and to the defence of Mariolatry, relicacy, transubstantiation, communion in one kind, and other doctrines and practices of the middle ages, which he attempts to deal with in a philosophical manner. His most important works are the *Breviloquium*, a text-book on dogmatics;

the *Itinerarium Mentis in Deum*, and *De Reductione Artium ad Theologiam*, in which he represents union with God as the highest good; and a commentary on the *Sententie* of Peter the Lombard, in which he acutely argues against the eternity of the world, and also advances some original proofs of the immortality of the soul. He did more than any other of the early theologians to give a scientific form to the mystical theology. His *Biblia Pauperum*, or 'Poor Man's Bible,' is a mystico-allegoric explanation of the plain contents of the sacred books for the benefit of the laity. In warmth of religious feeling, however, and in the practical tendency of his ethics, he far excels the hair-splitting scholastics. There have been editions of St Bonaventura's works in 1588-96, 1864-71, and 1882-92. See the works on him by Hollenberg (1862), Richard, Borgognoni, Vicenza, Prosper, Skeay (1889), Cherance (1899), and Costilloe and Conway (1911).

Bona Vista, a bay, cape, and town on the east coast of Newfoundland. The town is a port of entry, and one of the oldest settlements in the island. Pop. 4000.

Bonchamp, CHARLES, MARQUIS DE, one of the bravest of the Vendean leaders, was born at the château of Juverteil, in Anjou, May 10, 1760. He served as a volunteer in the American revolutionary war, and was a captain in the French army at the outbreak of the French revolution. A strong royalist, he naturally disliked the revolution, and consequently lived in retirement until chosen leader of the Anjou insurgents. In conjunction with Larochejaquelein and Cathelineau he fought with great bravery and frequent success, but his superior knowledge of military tactics was not sufficiently made use of by the insurgent army. In the sanguinary encounter at Cholet, October 17, 1793, Bonchamp received a fatal shot in the breast, and when his followers vowed to revenge his death on five thousand republican prisoners, the dying hero exclaimed: 'Spare your prisoners. I command it.' This last command was obeyed.

Bond, in Law, is an instrument on stamped paper, by which the party granting it becomes bound to pay a sum of money, or perform any act or duty, according to the terms of agreement.

In England and the United States, a bond is said to be an instrument under seal, whereby one person becomes bound to another for the payment of a sum of money, or for the performance of any other act or thing. The person who is thus bound is called the obligor, and he to whom the bond is given, the obligee; and this obligation may be either by or to one or several persons. The bond may be unconditional simply for the payment of money, or it may be accompanied with a condition, the performance of which is secured by a penalty; but in any event, the debt

created by a bond is a *Specialty Debt*, which, however, has now no preference over simple debts, the only distinction being that a specialty debt takes twenty instead of six years to prescribe. See DEBT. A bond, being an instrument under seal, requires no consideration to support it. The acceptance of a bond for a simple contract debt causes the debt to merge in the bond.

The requisites of a good bond are as follows: (1) The bond must have an obligor and obligee. In regard to such parties, it is to be observed that in general no person who is under any legal disability to contract can become an obligor, though it is otherwise with an obligee. An infant cannot bind himself unless the bond be, for necessities; but a bond may be given to an infant, a lunatic, or an alien. (2) The bond must oblige the obligor to pay a definite sum of money on a specified day, or on the happening of a specified event. Formerly, on forfeiture of the bond, the whole penalty stipulated was recoverable at law. But now, in the case of a bond conditioned for payment of money, the obligee cannot recover more than the principal sum due, with interest and costs. So in the case of a bond conditioned for the performance of any written agreement, the obligee cannot take out execution to a larger amount than the damages actually sustained by him, with costs. (3) A bond must be so expressed as to create a clear legal obligation. But for this purpose no particular form of words is necessary; any mode of expression by which the intention appears will suffice. (4) The bond must be duly executed. Such execution, in general, is the same as that of deeds, the sealing being the essential solemnity; and although it is usual for the obligor to sign the bond, his signature is not necessary to its validity. Then the bond must be delivered, but it need not be dated; a bond has even been held good though it bear a false or impossible date, on the principle that deeds take effect from, and have relation to, the time of their delivery.

In Scotland the bond—personal bond, as it is called—differs in several points of form from the English instrument. It takes the form of a probative written obligation, subscribed by the obligor in presence of two witnesses, but without sealing; it does not bear to be for double the sum due, or any sum other than the correct one, which it states with precision, with a penalty, which is usually one-fifth of the principal sum; and it must be very specific in all its details. As in English practice, there are in Scotland two kinds of these instruments: first, bonds for money simply; and, secondly, bonds for the performance and accomplishment of some act, or, as they are called in the Scots practice, bonds *ad facta præstanda*. The Scottish bond takes forty years to prescribe. It is always registered in order that summary diligence may pass upon it. The penalty covers only the actual loss and expenses incurred by the creditor through the debtor's default.

A mortgage over land or other real estate is also in Scotland in the form of a bond, by which name, indeed, the mortgage is technically described. Thus, the ordinary form of heritable security in modern practice is the *bond and disposition in security*. By these mortgage bonds the borrower not only becomes personally bound in the repayment of the loan, but 'in further security and more sure payment' he also conveys to the lender the land, or other real property, itself, on which the sum is to be made a charge, with, in a certain event and under certain conditions, a power of sale, by means of which the creditor, on the debtor's default, may recover his money. The transmission of, and succession to, these securities are regulated chiefly by the Titles to Land (Scotland) Act, 1868, and

the powers of the bondholder by the Heritable Securities Act, 1894. There are in England bonds by which expectant heirs may operate on their reversions, and these are called *Post-obit bonds* (q.v.). The English law as to sales of reversionary interests was declared by statute in 1868. See REVERSIONARY INTEREST. The name bond is also applied to many securities or instruments embodying obligations, issued by governments, companies, or local authorities, whether strictly in the form of an ordinary bond or not; many such bonds are taken payable 'to bearer,' and are recognised as negotiable instruments. See DEBENTURE, LLOYD'S BONDS, NEGOTIABLE INSTRUMENT.

According to the law of both countries and the United States, certain bonds are void, such as a bond conditioned either to do something which the law considers wrong in itself, or which is legally prohibited, or to omit doing something which is a duty, or to encourage the performance of anything which is in the nature of a crime or offence against the law. In like manner, bonds to procure marriage, called marriage brokerage bonds, or to restrain marriage, or for immoral considerations, or in restraint of trade, are void. A bond, however, may be valid in part, or void in part, if such parts are separable. Joint and several bonds are the bonds of two or more obligors who bind themselves severally and jointly: if one pays the entire debt he is entitled to contribution from the other obligors. See BROUAGE BONDS, MORTGAGE, SPECIALTY DEBT.

BLANK BONDS were Scots securities, in which the creditor's name was left blank, and which passed by mere delivery, the bearer or holder being at liberty to insert his name in the blank space, and sue for payment. The intention originally was to facilitate the transmission of the obligation; but, experience having proved that they were used for fraudulent purposes, these bonds were, by a Scottish act passed in 1696, declared void. The act, however, excepts from its provisions the notes of trading companies, and indorsements of bills of exchange. The Companies Act, 1907, sect. 106, enacts that, notwithstanding the act of 1696, debentures to bearer issued in Scotland are valid and binding according to their terms.

BOND OF CORROBORATION is an additional obligation by the debtor in a bond to accumulate arrears of interest, or to cure some defect, or granted to the heir of the creditor to save the expense of making up a title. It used to be granted by the heir of the debtor, but since 1874 this has been rendered unnecessary by statute.

BOND OF CAUTION is the obligation given by guarantors for the faithful discharge of duty by judicial factors or other persons, or for the due payment of a debt by the debtor (see CAUTION).

BOND CREDITOR, in England, is the name sometimes given to a creditor whose debt is secured by a bond.

INCOME BONDS are bonds, now frequently issued by corporations in the United States and elsewhere, the interest of which is payable only when it is earned, and after the interest upon prior mortgages has been duly paid.

GENERAL MORTGAGE BONDS are bonds secured upon the entire property of a corporation, parts of which are already subject to one or more mortgages.

Bond, Sir EDWARD AUGUSTUS, born at Hanwell, 31st December 1815, entered the British Museum in 1838, became keeper of the MSS., and in 1878–88 was head librarian. He published catalogues of MSS. and fac-similes of Anglo-Saxon charters in the library; and, among other works, he edited the *Statutes of Oxford University* (1853), *Fletcher's Russe Commonwealth* and *Horsley's Travels in Russia in the 16th Century* (1856) for the Hakluyt

Society, *Speeches in the Trial of Warren Hastings* (4 vols. 1859-61), and *Chronica Monasterii de Melsa* or *Meaux* (Rolls Ser. 3 vols. 1866-68). He also helped to edit the *Fac-similes* published by the Palæographic Society, of which he was a founder and president. He died 2d January 1898.

Bond, WILLIAM CRANCH, an American astronomer, born 19th September 1789, at Portland, Maine, became a watchmaker, and erected one of the first private observatories in the United States. In 1838 he accompanied the exploring expedition sent by government to the South Sea, and in 1840 he became director of the observatory at Harvard University. Here he and his son, George Phillips Bond (1826-65), discovered a satellite of Neptune and the eighth satellite of Saturn. He died 29th January 1859.

Bondager, the term applied in the south of Scotland and in Northumberland to a female labourer whom a 'hind' or married farm-worker undertakes to supply for the regular field-work on a farm as a condition of his tenancy of his cot-house. She is frequently a member of his own family, or she may be merely engaged and boarded by him. The origin of the bondager system is the want of a sufficient rural population for the field-work of the neighbourhood.

Bonded Warehouses. The warehousing system is a plan for lessening the pressure of excise or customs duties by postponing payment of them until the goods on which they are levied pass to the consumer, or, at all events, to the retail dealer. A merchant who might import £1000 worth of wine or tobacco if he only paid duty on it by instalments as it went out to the dealer, would be quite unable to import so much if he had to pay heavy duty immediately upon the arrival of his goods. Hence the adoption of the bonded warehouse or warehousing system, which also affords to merchants facilities for free exportation. The taxable commodity is locked up in a 'bonded' warehouse, which has been approved by the Commissioners of Customs or of Inland Revenue. It is under the supervision of the revenue officers from the time it is entered into until it is finally cleared out of the warehouse, and the revenue is further protected by bond given for due exportation or for payment of duty. This bond was formerly entered into by the importer, but the security is now given by the warehouse-keeper. 'Bonding' was part of the scheme of Sir Robert Walpole in 1733, generally known as the 'Excise Scheme,' which was defeated, however, on account of its unpopularity. The system was first authorised for the customs by an Act of George III. in 1802. The excise system of warehousing dates from 1823. In successive years various acts and departmental regulations have been issued, extending or defining the privileges, and in 1882 the excise and customs systems were assimilated, the new code adopting excise methods to a considerable extent. While in the warehouse 'wet' goods—i.e. wines and spirits—may be operated upon by racking, blending, mixing, sweetening, and colouring, under strictly defined conditions. Wines may be refined and fortified. No compensation can be made by the Customs or Inland Revenue authorities to any importer or proprietor of goods by reason of any damage occasioned in the warehouse by fire or any other accident. The warehousing system has also, by retaining the goods for the owner, whoever he may be, created a complete system of paper-money in the transference of the title-deeds, as they may be called, of such goods—the dock-warrants or other documents—the possession of which is equivalent to possession of the goods.

Bondi, CLEMENTE, an Italian poet, was born 27th June 1742 at Mezzano, in Parma. He was educated by the Jesuits, and when still very young, was appointed to deliver lectures on rhetoric in the Royal Convent at Parma. Here he produced his first work, *Giornata Villereccia* (1773), a comic picture of the rural pleasures of the brotherhood. For having celebrated in verse the abolition of the Jesuit order, he was compelled to fly to the Tyrol; and after his return he lived at Venice, at Mantua, and at Milan, where he found a patron in the Austrian Archduke Ferdinand, who appointed him his librarian at Brunn. Later he lived at Vienna, where he died on 20th June 1821. His poems are lyrical, descriptive, satirical, and elegiac, written in pure style and graceful verse.

Bundu, a country of Senegal, West Africa, to the W. of Bambouk, lying between 14° and 15° N. lat. and 12° and 13° W. long. The surface of Bondu is mostly level, the climate healthy, and vegetation luxuriant alike in field and forest. Gold and iron are found, and cotton fabrics woven. The inhabitants, who are chiefly Fulahs, profess Mohammedanism. When Park, the first European to visit Bondu, was in the country, the royal residence was at Fatteconda; since, it has been removed to Bulibani, a place of 3000 inhabitants, on the principal river, the Falemé. The country is now a French dependency. Pop. 30,000—50,000.

Bone is the hard material of the skeleton of mammalian animals, reptiles, birds, and certain fishes. When the different bones of the skeleton are connected together, they form a framework which affords support to soft parts, and protects delicate organs from injury, while at the same time preserving the shape of the body. Further, the bones, being movably joined to each other, and being acted upon by the attached muscles, become a series of levers capable of executing various movements, and thus, in the case of the bones of the lower extremity, they are the passive instruments of locomotion. In colour, bone is white, but in the living body it has in addition a pink and slightly bluish tint. Besides being *hard*, it possesses a certain amount of *toughness* and *elasticity*, properties which are well marked in the ribs and clavicle. Arab children are said to make good bows of the ribs of camels, and the elasticity of the merrythought—i.e. united clavicles—of birds is familiar to all. Its strength is remarkable as contrasted with other substances:

Fine Freestone.....	1·0
Lead.....	6·5
Elm and Ash.....	8·5
Box, Yew, Oak.....	11·0
Bone.....	22·0

We thus see that bone is twice as strong as oak, and a cubic inch of bone will support a weight of 5000 lb.

Chemical Composition of Bone.—It consists of an animal and an earthy part intimately combined together. The following table shows a percentage analysis of adult human bones by Berzelius:

Animal Matter.....	33·30
{ Phosphate of Lime.....	51·04
{ Carbonate of Lime.....	11·30
{ Fluoride of Calcium.....	2·00
Earthy Salts { Phosphate of Magnesium.....	1·16
{ Soda and Chloride of Sodium (Common Salt).....	1·20
	100·00

If we expose a bone to intense heat, the animal matter is got rid of, and though the bone retains its original form, yet the slightest touch will cause its now unsupported earthy matter to crumble away. On the other hand, by soaking a bone in diluted hydrochloric acid, the earthy matters are

gradually dissolved out, leaving a tough, somewhat transparent, flexible, and even elastic substance, which also retains the original figure of the bone in its most minute details. This residue is softer and more flexible than cartilage, and when boiled in water it is almost wholly resolved into *gelatin*, which *sets* or gelatinises on cooling. We see in the ill-nourished children of large towns too many examples of how necessary is the proper relation of these two elements of bone to each other. In the disease called rickets, the earthy matter is deficient, and the too flexible leg-bones bend under the weight of the trunk; in the aged person, again, the osseous substance being more densely packed with earthy matter becomes brittle, rendering them peculiarly liable to fractures.

Bones are classified according to their shapes—viz.: (1) *long*—e.g. thigh-bone and arm-bone; (2) *flat* or *plate-like*—e.g. shoulder-blade and bones of skull-cap; (3) *short* and *irregular* or *cubical*—e.g. those of the wrist or the vertebrae.

On making a section of a bone, it will be seen that the osseous substance is arranged differently in different parts, being either dense and close, and called *compact*, or open and reticulated, and called *spongy* or *cancellated*. There is, however, no abrupt limit between the two kinds, for they pass insensibly into each other. Again, in all bones the part next the surface is compact, and forms a shell or crust which contains the spongy texture within. Long bones have a shaft of compact substance with very little spongy tissue within, but at each end the spongy tissue predominates, having only a thin coating of compact substance, and thus the expanded rounded extremities enter into the formation of joints. Flat bones consist of two layers of hard tissue with intermediate spongy texture usually called *diploë*. Irregular bones are spongy throughout, with only a thin crust of compact substance. Close examination of cancellous tissue reveals the fact that it consists of numerous slender bars or lamellæ, which unite together to form an open lattice-work (cancelli), from which it takes its name. Considerable strength is thus obtained without undue weight; and it will be seen that the strongest lamellæ run in those directions which are naturally exposed to the greatest pressure. The following experiment will show that spongy tissue is able to sustain great weight in spite of its apparently fragile nature: A cubic inch of cancellous texture was taken from the lower end of the thigh-bone and placed with its principal layers upright. Four hundred-weight was then placed upon it, but it did not give way in the least; six hundredweight made it sink half an inch; yet the cubic inch of bone itself did not weigh more than fifty-four grains.

Compact bone is also full of holes which are very small and require a magnifying glass to examine them. If a transverse section be examined under the microscope, these round openings are seen to be the mouths of longitudinal canals named after Clopton Havers, an English physician and writer of the 17th century, who first specially directed attention to them—*Haversian Canals*. Blood-vessels run in them, and the widest also contain marrow. They vary in diameter from $\frac{1}{100}$ th to $\frac{1}{50}$ th of an inch. They are short, and unite freely with each other. Those nearer the circumference open on the surface by minute pores; those placed deeply communicate freely with the spaces in the spongy tissue, so that they form an extensive network of tubes in which blood-vessels are lodged.

Each canal is surrounded by a series of concentric rings, each of which is a layer of condensed structure. Between these rings minute cavities are found, called *lacunæ*, generally oval in man. These communicate with each other and with the

Haversian canal in the centre by means of fine pores or tubes called *canaliculi*, and thus it is evident that nutrient material can pass from the



Transverse Section of Compact Tissue of Humerus, magnified about 110 diameters. (From Quain.)

Haversian canal through the rings of dense bone which surround it, and which with the lacunæ and canaliculi are grouped together under the name of a Haversian system.

Bone is covered externally by a fibrous membrane which adheres very closely, investing every part of the surface except where there is cartilage, and called the *periosteum*. In this membrane fine vessels and nerves ramify, ultimately sending their minute branches into the Haversian canals. If the periosteum should be stripped off, there is great risk that the denuded portion of bone will be deprived of its nourishment and die.

The interior of the shaft of long bones is hollow, and thus we get a further combination of strength and lightness. In some animals this hollow space is filled with air, but in mammals there are no air-spaces in any bones except those of the head. The hollow shaft is therefore filled with *marrow* (medulla), which occupies the spaces of the spongy bone, and even extends into the widest Haversian canals. Lining the medullary canal there is a fine membrane named the *internal periosteum*. Its vessels partly supply the bone and partly the marrow. In long bones the marrow is like ordinary Adipose Tissue (q.v.), but in short bones and in cancellated tissues generally the marrow is more fluid, contains fewer fat-cells, and is red in colour.

In addition to the blood supplied to the bone through the vessels in the periosteum, one of considerable size, called the *medullary artery*, enters the canal containing the marrow by a hole running obliquely through the dense bone. Complete anastomosis takes place between the arteries on the surface and those in the interior of the bone. As has been stated, nerves enter the bone, but how they terminate is uncertain; and experiments seem to show that healthy bone is almost devoid of sensibility, while, on the other hand, the pain of an inflamed bone is extreme. In its earliest stages, bone may be said to exist as a mass of cells having the outward form but none of the characters of bone. Soon, however, these cells become cartilaginous, and in due time points or *centres of ossification* appear; the cells alter their form and arrangement, and by a deposit of earthy materials the bony tissue gradually becomes formed, rendering the previously flexible substance rigid. However, bone does not form in cartilage in every instance, for the bones of the face and skull-cap arise in connective tissue. Hence we have two great modes of ossification—viz. *intra-cartilaginous* and *intra-membraneous*.

The uses to which a bone may be put are various. In the cooking of soups, bones form a constant ingredient, and become useful in supplying gelatin, which gives a *body* to the soup it would not otherwise possess. Even when buried, the organic matter is long retained—e.g. Gimbernat made soup from the gelatin of a mastodon's tooth, and Dr Buckland did the same from the fossil bones of the hyena. Where the soup is required of great lightness, for an invalid with weak digestive powers, the shavings of stags' horns may be employed, and these yield a *hartshorn jelly* free from oil, and which therefore sits lightly upon the stomach. How far gelatin is of itself nutritious is a disputed question (see GELATIN, FOOD, and NUTRITION). Animals, however, like the dog, which masticate, devour, and digest the entire bone, do derive benefit therefrom, in part from the gelatin, and in part from the earthy substances; and the same remark applies to the use sometimes made of small fish, where, after being thoroughly browned, they are entirely eaten. In times of scarcity in Norway and Sweden, the poorer people even eat the bones of mackerel and other fish.

Bone is largely used in making the handles of small brushes, table-knives and forks, and pen-knives, and in the manufacture of Combs (q.v.). Our forefathers, before the metals were known, fashioned fish-hooks out of bone, and used the spines in the tail and back-fin of certain fishes for pointing arrows. These uses of bone, coupled with the employment of the serrated teeth of sharks as a war-weapon, are still practised by many uncivilised tribes. The fatty and other organic matters in bone allow of its being employed as a fuel where coal or wood cannot be obtained, as in the pampas of South America and the steppes of Tartary. In these regions it is considered that the heat evolved during the combustion of the bones of an ox suffices to cook the flesh.

Bone is likewise serviceable in the arts in yielding bone-ash, bone-black, bone-dust, dissolved bones, phosphorus, and superphosphates, also certain oils and fats, which are employed in forming Lampblack (q.v.), and in making soap and glue. Bone may suffer from atrophy, hypertrophy, or degeneration (see RICKETS), often from constitutional affections due to Scrofula or Syphilis (q.v.); Caries and Necrosis (q.v.) are specific bone diseases; inflammation of the bone causes Ostitis; of the periosteum, Periostitis (q.v.); of the medulla, Osteomyelitis. For ossification of arteries, see ARTERIES, TUMOUR; and for broken bones, FRACTURE. Various matters connected with the bones will be found at ANATOMY, ARM, BIRDS, COLLAR-BONE, FOOD, HAND, JOINTS, OSSIFICATION, RIBS, SKELETON, SPINAL COLUMN, &c.

Bone, a city. See BONA.

Bone, HENRY, enamel-painter, was born at Truro, Cornwall, 6th February 1755. Apprenticed to a Plymouth china-manufacturer, he removed with his master the year after to Bristol, and here he worked for six years at the famous Bristol china-works until their failure drove him to London to push his fortune. He soon found employment in enamelling watches and fans, and afterwards in making enamel portraits, brooches, &c. A portrait of his wife, exhibited at the Royal Academy in 1780, first attracted public attention; and he soon obtained a position which rendered it no longer necessary for him to continue his drudgery for the jewellers. In 1801 he was appointed enamel-painter to George III., and elected associate of the Royal Academy. Elected R.A. in 1811, he exhibited in that year his large enamel, 'Bacchus and Ariadne,' after Titian, which was sold for 2200 guineas, and is now in the National Gallery. From

this time, until his eyesight failed in 1831, he produced a series of large and beautiful works, among them the well-known 'Death of Dido,' and 'Hope Nursing Love,' after Sir J. Reynolds. He also executed a large number of historical portraits of the time of Elizabeth, besides a series of portraits of the Russell family. He died December 17, 1834. His works are now eagerly sought after by collectors, and are esteemed among the very best examples of his particular art.

Bone-ash, or BONE-EARTH, is obtained by the complete combustion of bones in an open furnace, when the oxygen of the air burns away the organic matter or gelatin, and leaves the earthy constituents as a white friable mass, the size of the original bone, but readily reducible to the condition of coarse powder which is bone-ash. A very large quantity of bone-ash is exported from South America to other countries, especially Britain. The used-up bone-black of the sugar-refiner is also employed as a source of bone-ash, by being heated in a furnace exposed to the air. Bone-ash of good quality contains about 80 per cent. of phosphate of lime, and 20 per cent. of carbonate of lime, phosphate of magnesia, soda, and chloride of sodium (common salt); but it is occasionally found mixed with sand, especially that procured from South America. Bone-ash is employed to some extent as a source of Phosphorus (q.v.), and in the making of Cupels (q.v.) for the process of Assaying (q.v.); but the most extensive use is in the manufacture of artificial manures, such as dissolved bones and superphosphates (see BONE MANURES below).

Bone-beds, the name given by geologists to thin beds or layers which are largely made up of the debris of bones of reptiles, fish, &c. Examples are the Ludlow bone-bed of the Silurian, the Bettes bone-bed of the Bradford coal-measures, the Rhetic bone-bed, and the Tilgate stone of the Wealden series. In the bone-beds of more recent geological age mammalian remains abound, as in the Suffolk bone-bed of the Coralline Crag.

Bone-black, the product of the carbonisation of bones, used as a pigment (see BLACK) and as a deodoriser. See CHARCOAL.

Bone Caves. See CAVES.

Bone Manures are applied to crops on account of the nitrogen—equivalent to 4 or 5 per cent. of ammonia—and the phosphate of lime which they contain—the latter amounting to nearly half their weight. Their value has only recently been discovered. The first crude bone-crushing machines were used in England in 1814. In Scotland, when bones began to be employed as manure, about 1825, they were roughly broken into large splinters with hammers by the farm-servants during wet weather, and 30 bushels applied per acre, at a cost of half-a-crown a bushel. Five hundredweight per acre is now considered a good dressing. Bones are not applied in good practice in a larger size than that of *meal* or *flour*—in other words, ground into a fine state of division.—*Rough Bones*, as quarter-inch size and larger, are now never used, as these lock up capital in the soil by taking too much time to decay, and do not give a remunerative return in comparison with manures that act quickly. Bones were sometimes formerly fermented to induce decay. They were piled in heaps, and water or urine poured over them. When the heat resulting from the fermentation went down, they were turned and watered again, and this kept up for a few months. Bones in an altered form are also used in making up concentrated manure, and are either ground or acted upon by sulphuric acid—for example:

(1) *Steamed Bone*, or degelatinised bone, results when bone is made friable and more easy of assimilation by plants through the action of superheated

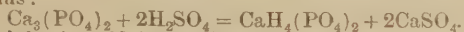
steam (at 270°–280° F.) removing the fatty and gelatinous matter; but there is a loss of nitrogen in the process, as there is also in the preparation of ash and char.

(2) *Bone-ash* is the residue from bones burnt as fuel used in the 'rendering' of the fat of cattle in South America.

(3) *Bone-char* is made by heating in a close retort, and used largely for refining sugar before it goes for manure.

(4) *Vitriolised Bone* is a material only partially acted upon by acid—the result of a most wasteful practice deserving of condemnation, as destroying microbes which bring about nitrification in the soil.

(5) *Dissolved Bone* is bone broken into half-inch size, and then acted upon by sulphuric acid, so as to change a portion (about half) of the insoluble tribasic phosphate of lime into the soluble monobasic phosphate and the sulphate of lime; thus:



Sulphuric acid is peculiarly suitable for this purpose as compared with, say, hydrochloric acid, as by the formation of sulphate of lime—or, in common language, plaster of Paris—a part of the moisture is absorbed, and the resulting material is left in a dry condition, which is essential for its proper distribution on the land. The object—extraordinary minuteness of division—is obtained, although the soluble condition disappears soon after its application to the soil; for the acid phosphate reacts with carbonate of lime in the soil, and the normal or tri-basic phosphate is precipitated. The dissolving of bones is now held to be wasteful because soluble phosphate of lime is procurable from many other cheaper sources. Liebig was the originator of the method in 1839, and during the next few years it was taken up by leading farmers in England and carried out as a farm operation. Now the work has fallen into the hands of manufacturers who can make it cheaper and, if they choose, better. Much adulteration has been practised in this trade at the expense of farmers. This was made possible owing to their ignorance and prejudices against learning anything scientific. Much manure sold as 'dissolved bone' is merely a mixture of soluble phosphate and some such nitrogenous material as nitrate of soda and sulphate of ammonia—the valuable substances being in the proportions present in bone. Soluble phosphate of lime, from whatever source, has a more beneficial influence on the turnip-crop than upon any other crop, because the turnip roots are not so able as the roots of other plants, such as wheat, to make use of the natural supply of phosphates existing in the soil in the insoluble form, even when this is abundant. Should the stock of phosphoric acid in the soil be reduced too far, the crop produce is reduced accordingly; it is necessary, therefore, to apply at least sufficient of this ingredient to make up for the loss resulting from the removal of the sale produce of a farm. The famous example of the deterioration of the Cheshire pastures on the rich soils of the new red sandstone by the yearly drain of phosphates through the sale of dairy produce, is now a matter of history. It is recorded that by the application of bones to these soils the value was doubled. Bone meal or flour is the most valuable form for application to thin, light, or hungry soils, as it decays in time to feed the growing crop, and is not liable to be washed out. In heavy land, ground bones are of little or no value—they get imbedded in the clay, and are preserved so that they cannot yield their substance to act as manure. On such soils the phosphate of lime should be used in the soluble form. Many thousands of tons of bones are annually imported from South America.

Boner, CHARLES (1815–70), born at Bath, became correspondent in Austria of the *Daily News*, translated much from German, and published books on chamois-hunting, on forest-creatures, and on Transylvania (1865), besides verses.

Boner, ULRICH, one of the oldest German fabulists, was a preaching friar of Bern, and is frequently mentioned in documents of 1324–49. His collection of a hundred fables was entitled *Der Edelstein*, and was first printed, with woodcuts, at Bamberg in 1461. An edition of 1757 supplied Lessing with materials for the study of fable. A critical edition by Pfeiffer appeared in 1844.

Boneset, a kind of Eupatorium (*E. perfoliatum*), also called Thoroughwort, is infused and employed in the United States as a domestic remedy for rheumatism, wounds, and influenza.

Bonesetters are a class of men who often possess a considerable local reputation for success in the treatment of injuries to the limbs, especially in cases where stiffness and pain have persisted long after an accident. They are usually uneducated men; and the knowledge they possess has been handed down by oral tradition, often for many generations and in the same family. Their chief method in the cases alluded to consists in effecting a sudden forcible movement of the affected part. As they are ignorant of anatomy, and of the signs of disease, they sometimes do immense harm by applying the method to unsuitable cases. But without doubt they have sometimes effected a cure where regular practitioners have failed. A detailed account of their methods, &c. was given to the medical profession by Dr Wharton Hood in a book *On Bonesetting* (1871). See DISLOCATION, FRACTURE.

Boness, or BORROWSTOUNNESS, a seaport in Linlithgowshire, on the Firth of Forth, 23 miles WNW. of Edinburgh. A dingy place, it has a fine parish church (1886), a wet-dock of 7½ acres (1881), a large shipping trade in coal, and manufactures of salt, soap, malt, vitriol, iron, earthenware, &c. *Graham's Dyke*, otherwise Antoninus' Wall, traverses the parish. Dugald Stewart spent the last twenty years of his life at Kinneil House (Duke of Hamilton) in the neighbourhood. Pop. (1851) 2645; (1881) 5284; (1921) 10,162.

Bonfire, a fire kindled in celebration of some event of public interest, usually in an open conspicuous place, as the top of a hill, or the centre of a village-green, but applied also to any great blazing fire of whatever material. Such fires were especially lighted on certain anniversaries, as the eves of St John and St Peter, and their origin in our country may be traced to pre-Christian times. The Scots form *bane-fire* best shows the origin of the word—a fire for burning bones; Sir J. A. H. Murray noted that for the annual midsummer 'bauefire' or 'bonfire' in the burgh of Hawick old bones were regularly collected and stored up down to about 1800. See BELTANE, BEACON, and vol. i. of Ellis's edition of Brand's *Popular Antiquities*.

Bongar, or ROCK-SNAKE (*Bungarus*), a genus of venomous serpents allied to the genera Elaps and Naja, and distinguished by the compressed body, which bears on the back a row of hexagonal scales larger than the rest. The head is broad and depressed; the tail is short. The species, which appear to be few—only two being certainly known—are natives of the East Indies. *B. caeruleus* (paragada) is very poisonous, and has a dark-blue ground colour, with narrow white lines in front, and cross rows of spots behind. *B. annularis* (pamah), also very poisonous, has black rings on a yellow ground, may be over 6 feet in length, and is found in Ceylon and China as well as in India.

Bongardia, a peculiar herbaceous genus of Berberideæ (q.v.). The only species (*B. Rawolfi*), found from Greece to Central Asia, produces tubers, which are eaten, either boiled or roasted, in Persia; and the leaves have an acid taste, and are eaten as a salad.

Bongo, or OBONGO, are a Negroid people in the basin of the Ogowe (q.v.). Also a very shy African forest antelope, largest of the bushbucks.

Bonheur, ROSA, animal painter, born at Bordeaux, 16th March 1822. Her first master was her own father, Raymond Bonheur, an artist of merit, who died in 1853. In 1841 she figured for the first time in the Salon, showing a couple of small works—'Two Rabbits' and 'Goats and Sheep'—that indicated the department in which she was to attain future eminence. These were followed by a succession of highly finished compositions; the year 1849 producing what some consider her masterpiece, 'Ploughing with Oxen,' now in the Luxembourg. In 1853 her famous 'Horse Fair' was the principal attraction of the Salon; it was acquired for over £10,000 from the Stewart collection by Mr C. Vanderbilt, who presented it to the Gallery of New York. One of the two smaller replicas—that from which the well-known engraving was made—is in the National Gallery, London. In 1865 she exhibited a large landscape, 'Hay-making in Auvergne.' Rosa Bonheur long directed a School of Design for young girls. In 1853 she became entitled to the cross of the Legion of Honour, but because of her sex the decoration was withheld till 1865. During the siege of Paris (1870–71), her studio and residence at Fontainebleau were spared and respected by special order of the Crown Prince of Prussia. Her success in painting was largely due to conscientious study of living subjects; she succeeded in rendering spirited action in animals; and many of her works are known in England through engravings. She died 26th May 1899. See Lives by Laruelle (1885), Peyrol (1885), and Roger-Miles (1900), and Muther's *Modern Painting*.

Boni, a state on the east coast of the south-west peninsula of the island of Celebes, in the Pacific Ocean, with an estimated area of 935 sq. m. It was formerly the most powerful state in Celebes, but since 1859 has been practically a Dutch dependency. In the north the scenery is fine, and the soil fertile—rice, sago, and cassia being produced. The inhabitants, called Bugis, have an allied language to the Macassars, with a literature of their own. Their towns and villages dot the coast, and as enterprising merchants and sailors the Bugis are found in every port of the East Indian Archipelago; they also engage in agriculture and in the manufacture of cotton and articles of gold and iron, in which they have a large trade. They are well built, active, and brave, and are lighter skinned, as well as superior in honesty and morality to other Malay races. Their institutions, said to be very ancient, partake of the character of a constitutional monarchy. The British have twice attacked the Bonese for injuring their commerce, and selling the crews of British ships into slavery. In the second attack, in 1814, the Bonese king was killed. The number of the population is unknown; some estimates give as much as 200,000. The capital, called Boni, stands on the coast of the south-west peninsula.—The GULF OF BONI separates the south-east and south-west peninsulas of Celebes. It is 200 miles long, and 40–80 miles broad.

Boniface, the name of nine popes, most of whom are of no historic note.—Boniface I. (418–22) was the first who assumed as Bishop of Rome the title of First Bishop of Christendom.—Boniface III., who was pope only for ten months in the year 607,

was the first to whom the title of Universal Bishop of Christendom was conceded by the Greek Emperor (Phocas).—Boniface VIII., previously Benedict Cajetan, a native of Anagni, was elected pope in 1294. His inauguration was distinguished by great pomp: the kings of Hungary and Sicily held the reins of his horse as he proceeded to the Lateran, and with their crowns upon their heads, served him at table. His tenure of the Roman see was marked by the most strenuous assertion of papal authority. In a bull of 1302 he claimed to possess supreme power alike in temporal and spiritual affairs. He failed, however, in his attempts to assert a feudal superiority over Sicily, and to exercise his papal authority in the disputes between France and England. He sought without success to call Edward I. of England to account for his attempted conquest of Scotland. Philip the Fair of France, supported by his states and clergy, maintained the independence of the kingdom, disregarding many bulls and briefs, and even the sentence of excommunication to which the pope proceeded. Philip at last, with the aid of Italian enemies of Boniface, made him prisoner at Anagni, to which he had fled; and though he was liberated by the people of Anagni, he died at Rome soon afterwards in 1303. For his simony Dante has given him a place in the *Inferno* (canto xxvii.). He instituted the Roman jubilee in the year 1300, granting a plenary indulgence to all who should visit the sanctuaries of Rome in that year.—Boniface IX. (Peter Tomacelli), a native of Naples, succeeded Urban VI. as pope at Rome in 1389, whilst Clement VII. was pope at Avignon. He became notorious for his shameless sale of ecclesiastical offices and benefices, and of dispensations and indulgences. He acquired, after a struggle, a most despotic power in Rome. The annates, which had previously been an occasional payment, were by him made permanent in 1392. He died in 1404.

Boniface, a generic name for an innkeeper, like 'mine host' or 'landlord,' from the name of the jovial innkeeper in Farquhar's *Beaux' Stratagem* (1707).

Boniface, St., 'the Apostle of Germany,' whose original name was Winfried, was born at Crediton, in Devonshire, about 680. He entered a Benedictine monastery in Exeter at the age of thirteen, and afterwards removed to that of Nursling, in Hampshire, where he taught rhetoric, history, and theology, and became a priest at the age of thirty. He seems to have adopted the name Boniface when he first turned monk. A movement, proceeding from England and Ireland, was still going on for the conversion of the heathen peoples of Europe; Gallus and Emmeran had been sent in 614 to Alemannia, Kilian (murdered 689) to Bavaria, Willibrord (died 696) to the country of the Franks, and Siegfried to Sweden. Winfried also took the resolution (716) of preaching Christianity to the Frisians, among whom it had not yet found entrance. But a war broke out between Charles Martel and the king of the Frisians, and Winfried returned from Utrecht to Nursling, of which he might have become abbot. But bent upon his design, he repaired to Rome in 718, and received the authorisation of Pope Gregory II. to preach the gospel to all the tribes of Germany. He went first to Thuringia and Bavaria, then laboured three years in Friesland, and travelled through Hesse and Saxony, everywhere baptising multitudes, and consecrating their idolatrous groves as churches. In 723 Gregory II. called him to Rome; consecrated him bishop, and furnished him with letters to Charles Martel and all princes and bishops, requesting their aid in his pious work. Returning to Hesse (724), he destroyed the objects of heathen

worship (among them the sacred oak of Geismar, which he cut down, and yet escaped the vengeance of the thunder-god), founded churches and convents, dealt strictly with immoral priests and bishops, heretics and Irish Christians who refused the Roman obedience, and called to his aid priests, monks, and nuns from England. Gregory III. sent him (732) the pallium, and named him archbishop and primate of all Germany, with power to establish bishoprics wherever he saw fit. Boniface now made a third journey to Rome (738), and was appointed papal legate for Germany. The bishoprics of Ratisbon, Erfurt, Paderborn, Würzburg, Eichstätt, and Salzburg owe their establishment to St Boniface. The famous abbey of Fulda is also one of his foundations. In 746 he was chosen Archbishop of Mainz, and in 752 he is said to have consecrated Pepin as king of the Franks at Soissons. In 754 he resigned the archbishopric, and had resumed his apostolical labours among the Frisians, when at Dokkum, 18 miles north-east of Leeuwarden, in West Friesland, he was fallen upon by a band of armed heathens, and killed, along with the congregation of converts that were with him (5th June 755). His remains were taken first to Utrecht, then to Mainz, and finally to Fulda. In the abbey there is still shown a copy of the gospels written by him, with a leaf stained with his blood. A collection of his letters, and the canons he promulgated for the discipline of the newly-established churches, have been preserved, and are instructive as to the state of Germany at the time. The best editions of his Letters (*Epistolæ*) are those of Giles (2 vols. Lond. 1844), and Jaffé (Berlin, 1866), to which is appended the Life of him by Willibald. In 1811 a monument was erected to St Boniface on a hill near Altenberga, in the principality of Gotha, where, according to tradition, he had founded (724) the first Christian church in North Germany. A statue by Henschel was also erected to him at Fulda in 1842. See German works on Boniface by Seiters (1845), Müller (1870), Werner (1875), Fischer (1881), Ebrard (1882), and Kuhlmann (1895); also Merivale, *Conversion of the West: the Continental Teutons* (1878).

Bonifa'cio, STRAIT OF, the modern name of the strait between Corsica and Sardinia, the *Fretum Gallicum* of the Romans. At the narrowest part it is only 7 miles wide, and its navigation is difficult. The strait receives its name from the small fishing-town of Bonifacio in Corsica.

Bonifacius, Roman general and governor of Africa under Valentinian III., invited Genserik (q.v.) and his Vandals into the country, and died of wounds received in a duel with Aetius (q.v.).

Bonin', or (Japanese) OGASAWARA ISLANDS, a volcanic group in the Pacific Ocean, 700 miles SSE. of Japan, with an area of about 30 sq. m. Discovered by Tasman in 1639, they were taken possession of for Britain in 1827 by Captain Beechey; but in 1878 the Japanese reasserted their sovereignty with the view of making them a penal settlement. The harbour is named Port Lloyd.

Bonington, RICHARD PARKES, painter in oil and water-colours, was born at Arnold, near Nottingham, on 25th October 1801. His father, who had been governor of Nottingham prison, after many vicissitudes settled at Calais, where the son was placed under Louis Francia, the water-colour painter; and he afterwards studied in Paris—in the Louvre, at the Institute, and under Baron Gros. His water-colours sold rapidly. In 1822 he began to exhibit in the Salon, and received a premium from the Société des Amis des Arts for his views of Havre and Lillebonne; and two years later he was awarded a medal at the Salon, when Constable and Copley Fielding were similarly

decorated. He now occupied himself with lithography; many of his sketches were reproduced by this method in such works as Baron Taylor's *Voyages Pittoresques dans l'ancienne France*, and he occasionally drew upon the stone himself, from his own designs and those of other artists. A fine collection of his work of this kind is preserved in the print-room of the British Museum. About 1825 he took to oil-painting, and in that year visited England, accompanied by Delacroix, in whose studio he worked after his return to Paris; and having visited Italy, he produced his splendid Venice views of the 'Ducal Palace' and the 'Grand Canal,' which figured in the Salon of 1827, along with his 'Francis I. and the Queen of Navarre' and his 'Henry III. receiving the Spanish Ambassador.' He also exhibited in the Royal Academy and the British Institution. His position was now fully established, and commissions came to him in plenty; but he caught an attack of brain-fever from exposure while sketching in the sun, and speedily fell into a decline. He visited London for medical advice, and died there, 23d September 1828. Of late years the fame of Bonington has been steadily increasing, and he is recognised as a most accomplished and original painter of landscape and architectural subjects, as well as of scenes of historical *genre*. He is especially admired for the purity and brilliancy of his colouring. His 'Henry III. receiving the Spanish Ambassador' was bought by Lord Hertford for 49,000 francs; and his 'Grand Canal, Venice,' and the 'Fishmarket, Boulogne,' realised £3150 each at the Novar sale. The Louvre contains several of his studies and an admirable example of his figure-pieces in oil, 'Francis I., Charles V., and the Duchess d'Etampes.' The National Gallery possesses the 'Piazzetta, St Mark's, Venice,' 'Sunset,' and some water-colours. See Muther's *History of Modern Painting* (1895-96).

Boni'to, a name common to several fishes of the mackerel family (*Scombridæ*).—(1) One of these, *Thynnus pelamys*, sometimes called the



Bonito, or Stripe-bellied Tunny.

Stripe-bellied Tunny, and of the same genus with the Tunny (q.v.), is well known to sailors as an inhabitant of the tropical parts of the Atlantic and Indian Oceans, and as one of the fishes most frequently seen pursuing the flying-fish. It is often taken by an imitation flying-fish made to skim along and touch the waves. Its flesh is not regarded as very wholesome, though not unnaturally relished by those who have been previously confined to salt provisions. It is occasionally but rarely caught on the British coasts. It is a very beautiful fish, seldom exceeding 30 inches in length, of a beautiful steel-blue colour, darker on the back, and whitish below. Four dark lines extend along each side of the belly. The general form resembles that of the mackerel, but is less compressed.—(2) The Mediterranean Bonito (*Pelamys sarda*) is closely allied. It has the same blue back and dark transverse bars reaching from the dorsal ridge to the lateral line. It is plentiful in the Black Sea, and has been found in the North Sea. Its flesh is esteemed.—(3) The Plain Bonito (*Auriss vulgaris* or *A. rochei*), found in the Mediterranean,

may be distinguished at once from both of these by its more uniform blue colour, without stripes or bands, and by the widely separated dorsal fins. Its flesh is little esteemed when fresh; it is generally used either salted or pickled. This fish has been occasionally caught on the coast of England, and even of Scotland.—The Sucking-fish (*Echeneis remora*), credited with retarding ships, the gorgeous John Dory (*Zelus faber*), the beautiful 'Dolphins' (*Coryphæna*), are allied genera of the same family. See MACKEREL.

Bonivard, FRANÇOIS DE, a younger son of a family which held large possessions under the House of Savoy, was born about 1496 at Seyssel, on the Rhone, and in 1513 became prior of St Victor at Geneva. Falling under the suspicion of the Duke of Savoy, he was taken prisoner by him in 1519. After twenty months' imprisonment he was set free, but in 1530 he was again seized, and taken to the castle of Chillon at the east end of the Lake of Geneva, where he was imprisoned for six years, the last four in that subterranean vault which the genius of Byron has made famous by his poem on the sufferings of *The Prisoner of Chillon*. The details of Bonivard's history were unknown to Byron; the highly wrought description of the prisoner 'chained to a column stone' sprang from the imagination of the poet, and is now embodied in the local tradition. On the capture of Chillon by the Bernese and Genevese in 1536, he was liberated, and returned to Geneva. The priory of St Victor had meanwhile been razed for the defence of the city, and the now Protestant government, having devoted its revenues to the hospital, awarded Bonivard a pension. He died in 1570, leaving the town his books, which were the nucleus of the Geneva library. In his *Chroniques de Genève* (1551; printed 1831; new ed. 1867) and *De l'Ancienne et Nouvelle Police de Genève* (1555) he paints in the blackest colours the opponents of the dominant Calvinist party. The credit of Bonivard, now usually spelt Bonivard, has not been tenderly dealt with by modern criticism; he seems to have been an unclashed and unfrocked monk and priest, a *bon vivant* and drinker, a fickle politician.

See works by Chaponnière (1846), Vulliemin (1863), Gabrèl (1869); and Gribble's *Lake Geneva and its Literary Landmarks* (1901).

Bonn, a town of Rheinland, beautifully situated on the left bank of the Rhine (here 600 yards wide, and crossed by a fine bridge), 16 miles SSE. of Cologne, with which it is connected by a light railway as well as the ordinary main line. Bonn stands at the beginning of the fine scenery of the Rhine. The view of the Siebengebirge from the Alte Zoll is very beautiful. The Minster, said to have been founded by the Empress Helena in 320, but dating chiefly from the 11th and 13th centuries, has been restored since 1847. It is a good specimen of Romanesque and Transition, and has five towers, the middle one 311 feet high. Near the Minster is a monument to Beethoven, who was born in the Rheingasse (the birth-house now a Beethoven museum); and at Bonn are buried Niebuhr, Bunsen, and Schumann. Reinkens, the first Old Catholic bishop, made Bonn his residence. The university, founded in 1777-86, in 1802 was transformed into a lyceum, but was re-established in 1818, in the beautiful electoral palace (1717-30) and other buildings. There are five faculties—medical, legal, philosophical, and two theological (Protestant and Catholic). Among its professors have been Niebuhr, A. W. Schlegel, Arndt, Welcker, Dahlmann, Hermes, Argelander, and Simrock. It has a library of half a million volumes, a splendid laboratory (1868), an art museum (1884), archaeological and other collections, a botanic garden,

and an observatory; there is also a celebrated agricultural academy at Poppelsdorf, where are also some of the university institutes. The manufactures—jute, soap, chemicals, &c.—are unimportant. Pop. (1871) 26,030; (1919) 91,410, chiefly Catholic.—Bonn derives its origin from *Bonna*, one of the Roman stations in Germany. From 1273 till 1794 the residence of the Electors of Cologne, it was held by the French 1673-89; in 1703 surrendered to Marlborough; was acquired by France in 1801, and by Prussia in 1814.

Bonnat, LÉON JOSEPH FLORENTIN (1833-1922), born at Bayonne, studied at Madrid under Frederic Madrazo, and in Paris under Léon Cogniet. He gained the second *Grand Prix de Rome*, and, aided by his friends, went to Italy in 1858, where he resided for four years. He was first brought into notice by his 'Adam and Eve finding the Body of Abel' (1860), now in the gallery at Lille; and his 'Pasqua Maria' (1863) was much praised. He devoted himself to Italian *genre* pictures of moderate size, varied by such religious subjects as 'The Assumption' (1869), and the terribly realistic 'Christ on the Cross' (1874), commissioned for the Palais de Justice, Paris. He produced many remarkable portraits, among others those of Thiers, Victor Hugo, Grévy, Pasteur, Dumas, Carnot, and Renan.

Bonner, EDMUND, Bishop of London, was born about 1500, of obscure and doubtful parentage. The reputation he gained at Oxford by his knowledge of canon law recommended him to the notice of Wolsey, who made him his chaplain, and promoted him to several benefices. His zeal in King Henry's service, after Wolsey's fall, earned him due promotion; and in 1533 he was deputed to appear before the pope at Marseilles, to appeal for the excommunicated monarch to a general council. His language on this occasion is said to have suggested to his holiness the fitness of having him burned alive, or thrown into a caldron of molten lead, so that Bonner judged it prudent to leave Marseilles without notice. In 1540 he was made Bishop of London, and as such pronounced sentence on several Protestant martyrs, though it is certain he did his best to befriend Anne Askew. After Edward VI.'s accession, he gave proofs of his lukewarmness in the cause of reformation, and at length, in 1549, was committed to the Marshalsea, and deprived of his bishopric. The accession of Queen Mary (1553) restored him to office; and by his part in that bloody persecution which has made her reign infamous, he rendered himself thoroughly unpopular. On Elizabeth's accession (1558), Bonner accompanied his episcopal brethren to salute her at Highgate, but was excepted from the honour of kissing her hand. In May 1559 he was summoned before the Privy-council, and refused, with a consistency worthy of respect, to take the oath of supremacy. He was accordingly deposed from his bishopric, and again imprisoned in the Marshalsea, where he died in 1569. The utmost allowance for Fox's exaggerations cannot free Bonner from the charge of persecution; though it seems that he did no more than his official position demanded, and that with such reluctance as to bring down on him the censure of the Privy-council. And one should not forget that he was strict in castigating the lax morality of his clergy, that he remained steadfast to his principles, and that he bore his final misfortunes with manly resignation. See *The Reformation* in the 'Cambridge Modern History' (vol. ii. 1904).

Bonnet, a covering for the head, of which there are many varieties. The French, from whom we have the word, apply it as we do to male as well as female head-dress. The *bonnet rouge*,

or 'cap of liberty' of the revolution, was shaped like a man's night-cap (*bonnet de nuit*). A felt cap of this shape, such as was worn by the Phrygians, was amongst the Romans the emblem of liberty, and was assumed by slaves when manumitted. The English bonnet of former times was made of cloth, silk, or velvet, more or less ornamented. It was generally superseded by the hat in the early part of the 16th century; but in Scotland, bonnets were commonly worn for two centuries later. The genuine old bonnet of the Lowland Scottish peasantry was of a broad, round, flat shape, overshadowing the face and neck, and of a dark-blue colour, excepting a red tuft on the top. The fabric was thick milled woollen, without seam or lining, and exceedingly durable. No head-dress ever invented could stand so much rough usage. This 'braid bonnet' very closely resembles the *bonnet Bearnais*, or *béret Basque*, of the south of France. From its having been worn, till comparatively late times, by small rural proprietors, these came to be called *Bonnet Lairds*. The Highlanders have long worn bonnets of the same fabric, but these generally rise to a point in front, with ribbons hanging down behind. Such is the cap known as the *Glengarry Bonnet*. The *Balmoral* is flat, and is liker the Lowland bonnet. From time immemorial these various kinds of Scots bonnets have been manufactured at Stewarston and Kilmarnock, in Ayrshire. The Glengarry bonnet was formerly used as an undress cap by the infantry of the British army, and is still used by the Highland and other Scottish regiments.

Ladies' Bonnets are a brimless head-gear tied under the chin, now almost confined to old women and nurses. Those made of the fine stunted wheat straw, grown for the purpose in Tuscany, and called Leghorn and Tuscan bonnets, are well known. These have formed an important trade in that province for two centuries. Split-straw plait and bonnets formed of it are made at Luton and Dunstable (see STRAW MANUFACTURES). Willow-chip bonnets are made in the neighbourhood of Modena. Bonnets, partly or entirely of richer materials, such as horsehair, crape, velvet, and satin, with trimmings of feathers, lace, and artificial flowers, are made in Paris.

The word bonnet is also applied to the cover of a motor-car engine.

Bonnet, CHARLES DE, an eminent naturalist and philosopher, born at Geneva, 13th March 1720, was educated for the law, but devoted himself at a very early age to the study of natural history. A dissertation on aphides procured his election, in 1740, as a corresponding member of the French Academy of Sciences; and in 1743 he was admitted a Fellow of the Royal Society. At this time he was engaged in researches concerning polypi, the structure of the tapeworm, the respiration of insects, &c.; and in 1745 appeared his *Traité d'Insectologie*. His *Recherches sur l'Usage des Feuilles des Plantes* (1754) contained the result of much observation on important points of vegetable physiology. A severe inflammation of the eyes, putting a stop for two years to his researches in natural history, gave another direction to his studies, and he published several works on psychology, in which materialistic views decidedly prevail: the body is represented as the original source of all the inclinations of the soul, and all ideas are referred to movements of the nervous fibres; but his religious convictions remained always strong and unshaken, and in his *Idees sur l'Etat Futur des Êtres Vivants, ou Palingénésie Philosophique* (2 vols. 1769), he endeavoured to demonstrate the reasonableness of the Christian revelation. In this work he also maintained the future life of all living creatures,

and the perfection of their faculties in a future state. His *Considérations sur les Corps Organisés* (2 vols. 1762) is largely devoted to an examination of the theories of generation. He died on 20th May 1793. Collective editions of his works (8 vols. and 18 vols.) appeared in 1779 and 1788. See the monographs on him by Lemoine (1850) and the Duc de Caraman (1859).

Bonnet-piece, a gold coin of James V. of Scotland, so called on account of the king's head being decorated with a bonnet instead of a crown, as was usual. James V. was the first Scottish sovereign to place dates on his money, and to diminish the size of the gold coins by increasing their thickness. His bonnet-pieces were struck of native gold, and are now much prized by collectors. See Edward Burns' *Coinage of Scotland* (1888).



Bonnet-piece.

Bonneval, CLAUDE ALEXANDRE, COUNT DE, also called Achmed Pasha, a French adventurer, was born of a noble family at Coussac, in Limousin, on 14th July 1675; and entered the army in his thirteenth year. He served with distinction in Italy and the Netherlands, but for extortion and insolence was condemned to death by a court-martial. He fled to Germany, where he obtained employment in the Austrian service; fought against his native country, distinguished himself by many daring exploits, and bore a principal part under Prince Eugene in the war against Turkey. But during a residence at Vienna he made himself disagreeable to the prince, and was sent, in 1723, as master-general of ordnance to the Netherlands, where he quarrelled with the governor, was brought to trial, and condemned to death by a court-martial. The emperor commuted the sentence to one year's imprisonment, upon condition of his never afterwards setting foot on German soil. He went to Constantinople, became a Mohammedan, was made a pasha of three tails, and achieved success as general in the war of the Porte with Russia, and in Persia. The sultan appointed him governor of Chios; but his own imprudence, and the envy of others, caused his banishment to the shores of the Black Sea. He died at Constantinople on 27th March 1747. The memoirs published as his are spurious. See Prince de Ligny, *Mémoire sur le Comte de Bonneval* (1817), and Vandal, *Le Pacha Bonneval* (1885).

Bonneville, NICHOLAS DE, one of the earliest French students of German literature, was born at Evreux, March 13, 1760. Early works are his *Nouveau Théâtre Allemand* (12 vols. 1782-85), a collection of German tales, and a translation of Shakespeare. After the revolution, he founded and edited several newspapers; but his moderation in tone and his liberality rendered him obnoxious to the ruling party, and on the fall of the Girondists he was thrown into prison. He also got into difficulties with Napoleon, and died November 9, 1828. His *Histoire de l'Europe moderne* (3 vols. 1789-92) and his *De l'Esprit des Religions* (1791) are still read.

Bonny, or **BONI**, a town and a river of Guinea, now in the British Nigeria protectorate. The river forms an eastern debouchure of the Niger, and falls into the Bight of Biafra, in about 4° 30' N. lat., and 7° 10' E. long. It is accessible at all times of the tide to vessels drawing as much as 18 feet of water, and safe anchorage at all seasons of the year is found within its bar. Its banks are low,

swampy, and uncultivated. On the east side, near its mouth, is the town of Bonny, notorious from the 16th to the 19th century as the rendezvous of slave-trading ships. The houses forming the town stand in a swamp where fever prevails; European traders generally take up their quarters on river-boats moored in the current, of the Bonny. It exports considerable quantities of palm-oil.

Bonomi, JOSEPH, architect, was born at Rome in 1739, settled in England in 1767, became an associate of the Royal Academy, and died on 9th March 1806.—His son, JOSEPH BONOMI, the younger, born in Rome 9th October 1796, studied art in London, and became famous as a draughtsman, especially of Egyptian remains. He repeatedly visited Egypt and the Holy Land, and illustrated important works by Wilkinson, Birch, Sharpe, Lepsius, and other Egyptologists. He also published a book on Nineveh, and at his death, 3d March 1873, he was curator of Soane's Museum.

Bononcini. See BUONONCINI, HANDEL.

Bonpland, AIMÉ, an eminent traveller and botanist, was born at Rochelle, France, August 22, 1773. Having studied medicine and botany at Paris, he accompanied Humboldt in 1799 to South America, where they travelled nearly five years, during which time Bonpland collected 6000 new species of plants. After his return, he published several splendid and valuable botanical works. He went to Buenos Ayres in 1816, and was named professor of Natural History. Bonpland undertook an expedition of scientific discovery up the Paraná; but Dr Francia, then dictator of Paraguay, arrested him, and kept him prisoner for about nine years. He subsequently settled near San Borje, in the province of Corrientes, and died at Santa Anna in 1858. Among his works are: *Plantes Equinoxiales* (2 vols. 1808-16); *Monographie des Mélastomées*, &c. (2 vols. 1809-16); and *Description des Plantes rares de Navarre* (1813-17). See his Life by Brunel (3d ed. Paris, 1872).

Bonspiel. See CURLING.

Bonstetten, KARL VICTOR VON, publicist, born at Bern, 3d September 1745, studied at Leyden, Cambridge, and Paris, entered the council of Bern, and became district governor, and in 1795 a judge in Lugano. He lived in Italy and at Copenhagen from 1796 to 1801, and after his return settled at Geneva, where he died 3d February 1832. Among his larger works are *Recherches sur la Nature et les Lois de l'Imagination* (Geneva, 1807), *Pensées Diverses* (1815), *Études de L'Homme* (1821), and *L'Homme du Midi et L'Homme du Nord* (1824), an examination of the influence of climate. Three volumes of his correspondence were published. See Life by Büchi (1889).

Bonus, an originally jocular use of the Latin word for 'good,' 'a good man,' to mean 'a good thing,' especially an extra dividend given to shareholders of a company from surplus profits, a portion of the profits of an insurance company distributed amongst policy-holders, or an additional sum paid to employees in view of special conditions, as during and after the Great War.

Bonvalot, PIERRE GABRIEL, French explorer, was born in 1853 at Épagne, in the department of Aube. He was educated at the lycée of Troyes. He travelled in Central Asia in 1880-82 and in 1885-87. In 1889-90 he accompanied Prince Henri d'Orléans in his journey from Siberia to Tonkin. In 1897 he undertook a political mission to Abyssinia. He became a deputy for Paris in 1902.

Bony Fishes (*Teleostei*), an order of fishes, including the vast majority of living forms. They make their appearance in Jurassic strata, but it

was not until the Upper Cretaceous and Tertiary periods that they became predominant over their forerunners, such as Elasmobranchs and Ganoids.

In the bony fishes (*Teleostei*) the skeleton is bony, with completely formed vertebrae; the skin is usually clad in the characteristic light scales; the heart has a non-contractile swelling of the artery in front of the heart (the *bulbus arteriosus*); the gills are free and protected by a bony cover (*operculum*); the intestine has no spiral fold running down it; the nerves to the eyes simply cross one another, and do not fuse as they cross. Generally speaking, they are more active than their forerunners.

Günther divides the bony fishes into six orders, and since these must be repeatedly mentioned, the following key, based on the same authority, and copied from Leunis' *Synopsis des Thierreichs*, is essential:

I. *Acanthopterygii*—e.g. perch, mullet, beryx, mackerel, bull-head, lump-sucker, goby, blenny, gray-mullet, stickleback.

II. *Acanthopterygii Pharyngognathi*—e.g. wrass.

III. *Anacanthini*—e.g. cod, ling, sand-eel, turbot, flounder.

IV. *Physostomi*—e.g. carp, minnow, flying-fish, pike, salmon, trout, herring, eel.

V. *Lophobranchii*—e.g. pipe-fishes and sea-horses.

VI. *Plectognathi*—e.g. file-fish, coffer-fish, globe-fish, sun-fish.

Gills comb-like.	Pre-maxilla and upper jaw movable.....	Spinous rays on dorsal, anal, and ventral fins.	Lower pharynx } I. bones separate....
			United..... II.
	Without spinous rays.....		Ventral fin (if present) on throat or breast; air-bladder without duct... } III.
			Ventral fins posterior; air-bladder with duct..... } IV.
	Pre-maxilla and upper jaw rigidly fixed to one another and to skull.....		V.

Gills composed of small rounded lobes..... VI.

For further information, see the article on Fishes, and separate articles; consult Günther's *Introduction to the Study of Fishes*, Huxley's *Anatomy of Vertebrates*, and the *Cambridge Natural History* (vol. vii. 1901).

Bonyhád, a market-town of Hungary, in the county of Tolna, about 90 miles S. of Budapest. It has some trade in corn, wine, and tobacco. Pop. 10,000.

Bony Pike (*Lepidosteus*), also called GAR-PIKE and GAR-FISH (distinct from the other Garfish, q.v.), a genus of Ganoid fishes, found in widely distributed fossil form as early as Tertiary times, and still surviving in temperate America and Cuba. The fish measures at full size towards 5 feet in length, and is covered with a complete mail of lozenge-shaped enamelled and bony scales. The outer enamel layer is bright and glistening. The general colour is brownish-yellow or greenish with darker markings. The skeleton is completely bony, the vertebrae (like those of salamanders) convex in front and concave behind, the fins with accessory pieces known as 'fulcrs,' the dorsal and anal composed wholly of jointed rays, and situated far back. The snout is long and narrow, the mouth opening wide, the upper lip protruding beyond the lower, the dentition very well developed, with large catching and numerous small conical teeth arranged in rows. The paired fins are unlobed; the tail is markedly unsymmetrical (heterocercal). There are no spiracles, but accessory gills on the hyoid bones. The undivided

air-bladder is lung-like, opens into the gullet, and receives blood-vessels from the aorta. The dilated muscular chamber in front of the heart has eight transverse rows of valves. The bony pike or gar-fish lives in rapid rivers, swims with great force, has great flexibility in the neck region, and preys voraciously on other fishes. Formerly more widely distributed, it is now found in the fresh waters of North Central America and Cuba. Many species have been distinguished, but Günther only recognises three—*L. viridis*, *L. platystomus*, and the commonest *L. osseus*. The genus occurs as such in Tertiary strata, and is represented in earlier times by many forms (*Lepidotidæ*, &c.). The flesh of the bony pike is esteemed for food. See GANONDS.

Bonze, a modified Japanese word applied by Europeans to the Buddhist priests of Japan and of China.

Booby (*Sula piscator*), a species of Gannet (q.v.), which has received this name from its apparent stupidity in allowing itself to be knocked down with a stick or taken by the hand. Accounts differ very much, however, as to this character of the booby, some representing it as singular in not taking alarm nor becoming more wary even when it has had reason to apprehend danger from man; others, as Audubon, asserting in such a manner as apparently to place it beyond dispute, that it does learn to be upon its guard, and even becomes difficult to approach within reach of shot. The booby is not quite so large as its congener, the common gannet or solan-goose, but, like it, is a bird of powerful wing. It feeds on fish, which it takes by diving in the sea, observing its prey as it sweeps along in graceful and varying flight, sometimes



Booby.

at a height of only a foot or two from the surface of the water, sometimes twenty yards above it. The bird is sometimes taken, like the gannet, by means of a fish fastened to a board, through which it drives its bill, as it dashes at the bait. The booby is of a blackish-brown colour, whitish beneath; its colours are subject to some variation, and in young birds a general brown colour prevails; the sexes differ very little, except that the female is not quite so large as the male. The expansibility of the gullet enables the booby to swallow fishes of considerable size. The bill, which is straight, conical, and longer than the head, opens beyond the eyes, as in the rest of this genus. It is found on almost all tropical and sub-tropical shores, and sometimes even 200 miles from land. On the east coast of North America, it reaches about as far north as Cape Hatteras, but is much more abundant farther south, great numbers breeding on the low islands off the coast of Florida. The nest is often placed upon a low bush,

and 'is large and flat, formed of a few dry sticks, covered and matted with seaweeds in great quantity.' It contains only one egg or young one at a time. The booby is much persecuted by the Frigate Bird and Man-of-war Bird (q.v.), which are more powerful and of swifter flight, and often compel it to disgorge for their use the prey which has just been swallowed. The flesh of the booby, although sometimes eaten by sailors, is dark coloured, and not very agreeable.

Booby Island, a level rock in Torres Strait, in 10° 36' S. lat., and 141° 53' E. long., 3 feet above high water, and $\frac{1}{2}$ mile in diameter. Being dangerous to navigators, and destitute of resources of its own, it is pretty regularly supplied with provisions and water by passing vessels, for the benefit of shipwrecked sailors.

Boodroom. See BUDRUN.

Book. The volume which the reader has at present in his hands is a normal specimen of what is now understood by a printed book. Printed matter occupies both sides of a certain number of leaves of paper, which are so arranged that, beginning at the upper end of the left side of the first page, he may proceed without dislocation of thought always from left to right till he reach the lower end of the last page. The first page or *recto* of the first leaf or *folio* (often omitted, as in the present work), containing usually an abbreviated form of the title, is technically known as a *bastard* or *half title-page*; the next page or *verso* of the first folio is left blank. Then follows the *title-page* proper, usually with a blank page at the back. In many books there intervene a preface or introduction, a dedication, and a table of contents before the main body of the book begins. If any portion of the book has got out of its place, there are two ways by which the true order can be discovered. At the outer corner of each page is a number—1, 2, 3, &c.; this is the pagination or numerical order of pages. At the left-hand foot corner of page 1 is the number 53; and 54 will be found similarly on page 17. The sixteen pages thus indicated have been produced by the folding of a single sheet of paper. Fifty-three is the signature (as it is called) on the first page, because 52 sheets have been used in the previous volume. A, B, &c. are often used for numerals; and if the book goes beyond the number of letters in the alphabet, the series is continued—A A, B B, &c., or 2 A, 2 B, &c.

To understand the historic origin of this normal modern book, we must go back to a remote antiquity. The word 'book' itself (Old English *bōc*, Ger. *buch*, Dutch *boek*) appears in Gothic as a plural noun meaning 'letters of the alphabet.' There is difficulty in connecting it with the 'beech' tree (Old English *bōc*, *bēce*, Ger. *buche*, Dutch *beuke*). *Liber*, the Latin equivalent (which has been adopted by all the Romance and Celtic tongues—Fr. *livre*, Ital. *libro*, Gaelic *leabhar*, Welsh *leor*—and is the source of our English word *library*), properly meant bark, and was applied to prepared papyrus tissue from its bark-like appearance. The Greek *biblia*, in like manner, is associated with *byblos*—i.e. papyrus.

As it is now well known, the ancient Babylonians and Assyrians had a wide and varied literature. This was preserved in two ways: either painted on the leaves of the papyrus which grew in abundance on the banks of the Euphrates, or impressed on clay shaped into tablets or cylinders. Such skill was displayed in the treatment of this latter material that the inscribed characters by their minuteness 'suggest that they must have been written with the help of a magnifying glass.' A representation of a typical polygonal Assyrian clay-tablet will be found at WRITING. The Hittites

also used clay tablets. The defects, as well as certain advantages, of this form of 'book' are obvious. It has no direct connection with the modern European book. The case is different, however, with the ancient Egyptian book. The sequence may be maintained from the volume at present in the reader's hands back for thousands of years to the oldest Egyptian 'volume' still extant (in a sense the oldest book in the world)—the *Papyrus Prisse* (see ALPHABET, WRITING), which must be assigned to a very early period of Egyptian history, probably to 2500 or 3000 B.C. In the article WRITING there is further information about the earliest written books—Egyptian, Greek, Latin, and Indian, with illustrations of the characters employed. Owing to its wonderful adaptability to literary purposes, the prepared papyrus tissue (see PAPHYRUS) spread to Greece (at least before the time of Herodotus) and to Rome; and though it was partly supplanted, especially in certain regions, by the finer kinds of prepared skins—the material used by the Jews, Persians, and other oriental nations—it maintained its position as a book-material down to the 10th century A.D. Ali Ibn el Azhad in 920 describes the different kinds of pen required for writing on paper, parchment, and papyrus. Papyrus could not well have been utilised in any such form as the modern bound book. The ancient papyrus-book, whether Egyptian, Greek, or Roman, was got up very much like a modern mounted map. A length of the material, written on one side only, was fastened to a wooden roller, round which it was wound; this formed a *tama* (Egyptian), *kulindros* (Gr.), or *volumen* (Latin), hence our 'volume.' Specimens of Egyptian rolls still exist, extending to upwards of 20 and even 40 yards; but the great inconvenience attaching to the consulting of such enormous scrolls (though we still find similar pedigree rolls in England—e.g. at Helmingham, Suffolk) made it much more usual to break up any lengthy literary production into sections, each on a separate roll. Certain suitable sizes became normal, and this conventional length of the roll exercised a considerable influence on the length of what are still called the 'books'—i.e. divisions of the classical authors. In Egypt the rolls were kept in jars (holding say nine or ten each); in Rome in wooden boxes or canisters (often of costly workmanship), or in parchment cases. The change from the rolled to the folded form of book appears to have taken place in the ancient world after the adoption of parchment or vellum, though practically the same arrangement of successive surfaces had been in vogue in the books or tablets of waxed wood used for notes and letters. *Codex*, the Latin name for such a parchment volume, is still retained as the designation of the more important ancient MSS., as *Codex Alexandrinus*. The form remained practically unaltered throughout the middle ages, and being even more suitable for paper than for vellum, was ready on the invention of printing to facilitate its full development. For details in regard to the ancient MS., see PALEOGRAPHY. For Block-books, see WOOD ENGRAVING.

Sizes of Books.—The vellum, and afterwards the paper book of medieval times, was made up in the following way. 'Quires' or 'gatherings' were formed sometimes of four sheets folded in the middle and placed one within the other, so as to furnish eight leaves, sometimes of five sheets yielding ten leaves, sometimes of six yielding twelve. These groupings were known as quaternions (*tetradia*), quinterns or quinternions (*pentadia*), and sexterns (*hexadia*). This same method was adopted by the early printers, who at first indeed only printed as the copyists had written, one page at a time. In the colophons (see below) of many of the older books, a register or collation, as it is called, of all the quires—whether

ternions, quaternions, or so on—is supplied for the guidance of the bookbinder. The signatures on the several quires were at first inserted by hand, and were first printed at Cologne in 1472. When it became usual to print a certain number of pages at once, the paper was not folded and cut up till it had passed through the press. The number of times it required to be folded afforded a ready means of distinguishing in a general way the different sizes of books as long as the paper continued to be made by hand, in frames the size of which did not greatly vary. The nomenclature is still in vogue, though it has ceased in these days of machine-made paper to be a correct guide to the real sizes of books. In America, the proposal to distinguish sizes by an actual measurement of height and breadth of paper has met with some acceptance; but the old fashion still prevails in Europe. A sheet being folded in the middle forms two leaves or four pages; and a book composed of such sheets is styled a folio whether it measure $1\frac{1}{2}$ feet or 4 feet in height. When the sheet is again folded it makes a quarto. In hand-made paper (i.e. the paper used in nearly all books of purely bibliographical interest) the water-line runs either across or down the page according to the number of foldings. The following scheme is serviceable:

Folio, folded,	1 time = 2 leaves, water-line perpendicular.
Quarto, (4to)	2 times 4 " " horizontal.
Octavo, (8vo)	3 " 8 " " perpendicular.
Duodecimo (12mo) 4 " 12 " " horizontal.	
Sextodecimo (16mo) 4 " 16 " " horizontal.	

Less ordinary, and diminutive, sizes are 18mo (water-line perpendicular), 24mo (perpendicular), 32mo (perpendicular), 36mo (horizontal), 48mo (horizontal), 64mo (horizontal), 72mo (perpendicular), 96mo (perpendicular), 128mo (perpendicular). In this country for a long period printing-paper was chiefly of three sizes—royal, demy, and crown; and according as any one of these was employed, the size of the book was large or small. Demy, however, was the most commonly used; and the demy 8vo may be said to have become the established form of standard editions. The size of the present work is imperial 8vo. Among books, as among men, there are giants and dwarfs. Certain church-books in the Escorial are described as 6 feet in height by 4 in breadth; and the 'Antiquity' volumes, for example, of the Napoleonic *Description de l'Égypte* measure $37\frac{1}{2}$ inches in height. The 'Thumb Bible' is, on the other hand, not much bigger than a postage-stamp; Pickering's Diamond edition of *Tasso* measures $3\frac{1}{2}$ inches high by $1\frac{1}{2}$ wide; and Hoepli's 1878 *Divina Commedia* is less than $2\frac{1}{4}$ inches by $1\frac{1}{2}$.

Colophons.—The scribes employed by Assur-banipal (680 B.C.) used to place the account of their documents at the close of the last column on their cylinders. In like manner, the early European printers often gave details about their books in the closing paragraph, now technically known in English as the *colophon* (from a Greek word for apex or terminus), in French as *souscription*, in German as *Schluss-schrift*. Caxton varies his colophon from the simplest *Explicit, Hic finis*, or 'Here endeth,' to elaborate epilogues or post-faces. Quaintest of all, perhaps, is his rhyming conclusion to the *Moral Proverbs*:

Go thou litil quayer | and recōmaund me
Unto the good grace of my special lorde
Therle Ryueris, for I have emprinted the
At his cōmandement, folowynge cury worde
His cōpye as his secretaire can recorde.
At Westmestre of feuerer (February) the xx daye
And of Kyng Edward the xvij yere vraye (truly).

See Blades's *Caxton*, Legrand's *Bibliographie Hellénique* (1885), Kennard's *Some Early Printers and their Colophons* (1902).

Title-pages.—Though Caxton's work affords no

instance of a title-page—unless *The Chastising of God's Children* (1491?) be his, and it contains simply three lines of ordinary print—this does not represent the general stage of typographic development. The first printer lavish enough to devote a whole page to the title of a book was Arnold ther Hoernen of Cologne, who printed the *Sermo ad Populum* in 1470. Conrad Fyner of Esslingen followed in 1473. With the adoption of the title-page, the colophon naturally disappeared, though instances are found well into the 16th century. The treatment of the title-page has varied enormously at different periods: in the 16th and 17th centuries becoming at times so crowded with details as to lose half its value as a ready means of determining the purport of the book. 'Laudatory descriptions of the author and his work were freely introduced: 'Very necessary to be known'; 'Very pleasant and beneficial'; 'A book right rare and strange,' are among the phrases familiar to all book-lovers. Except in the case of works of fiction and popular theology, the tendency of the present time is to make the title brief and business-like. Dickens's *Adventures of Oliver Twist* even contrasts curiously with the title-page of the first edition of, say, *Robinson Crusoe*. Metaphorical titles (so abundant in the Elizabethan and Jacobian periods) are serviceable as distinctly individualising a book, but are very apt (as in Ruskin's *Notes on the Construction of Sheepfolds*) to mislead the unwary. Double titles (as in Ruskin's *Proserpina: Studies of Wayside Flowers*) are equally dangerous; and open to strong objection is the habit of re-issuing an old work with a new title. The title of a book is by English law as much the property of an author as any other part of his book. Consequently, a lawsuit may be the result of even unsuspectingly using a title already appropriated (see COPYRIGHT). Compare the fac-simile title-pages in Könecke, *Bilderatlas* (1887); Le Petit, *Principales Éditions originales d'Écrivains Français* (1888). See Lang, *Books and Bookmen*; Pollard, *Last Words on the History of Title-pages* (1891).

Dates.—In the dating of their books the early printers, like the scribes, were extremely negligent. 'Of twenty-one works,' says Mr Blades (*Caxton*, i. p. 31), 'known to have issued from the press of Colard Mansion, not more than five have any date to them; and of nearly one hundred publications attributed to Caxton's press, considerably more than two-thirds appear without any year of imprint.' At other times we find the date given with great precision: thus, *The Book of the Knight of the Tower* has 'and enprynted at Westminster the last day of Janyuer, the fyrst year of the regne of Kyng Richard the thyrde.' In the present day nearly all respectable publishers put the correct year in which their books are issued at the foot of the title-page, either in ordinary figures or in the Roman notation. When a book is not dated, one suspects a desire on the part of the publisher to sell his old stock as if it had newly seen the light. Unfortunately, the device of attaching a new title-page with a fresh date to matter that has lain in the warehouse for many years is adopted by firms whose reputation ought to be above reproach. The following are among the more important deviations from the normal methods of Roman notation to be found in the colophons or title-pages of early printed books (see Brunet, *Connaissances nécessaires à un Bibliophile*):

M CCCIII XX VIII = 1488 (i.e. 1000 + 400 + 4 × 20 + 8).

M IIII CIII XX VIIJ = 1488 (i.e. 1000 + (4 × 100) + (4 × 20) + 8).

M CD XCV = 1495 (i.e. 1000 + (500 - 100) + 95).

M IIIJ D = 1496 (i.e. 1000 + 500 - 4).

M IIID = 1497 (i.e. 1000 + 500 - 3).

CIO IO CXX VI = 1626 (i.e. 1000 + $\frac{1000}{2}$ + 100 + 26).

In many cases the older printers indulged in

curious chronograms; sometimes using them to repeat in the preface a date already distinctly stated on the title-page. An extreme instance is the *De spiritali Imitatione Christi sacra et viles pills in LVCEM Datae*, a R. P. Antonio Vanden Stock Societatis Jesu, Ruramundæ, Apud Gasparem du Pres—a book which contains upwards of 1500 chronograms on the date 1658 (see CHRONOGRAM); and James Hilton, *Chronograms* (1882), *Chronograms Continued* (1885), and *Chronograms Collected* (4000 additional, 1896).

When dates are wanting, the age of a book may often be approximately determined by certain external characteristics, which must, however, be used with caution. Watermarks (Ger. *wasserzeichen*; Fr. *filigranes*), for example, are of importance, but their evidence has been frequently strained. Compare article PAPER; and see the works of Fischer (1804), Boyer (1860), Midoux and Matton (1868), and Sotheby's *Principia Typographica*.

Place of Publication.—Even when the name of the place of publication is given in full, it may require some knowledge to recognise it under the several forms current in different languages and at different periods. Thus Cologne may appear as Colonia, Colonia Agrippina, Cueln, Ceulen, Keulen, Köln, &c.; or the periphrasis in civitate Coloniensi may be employed, the *n's* being represented by strokes above the vowels (see PALÆOGRAPHY); Venice may be more or less disguised as Venetia, Venetia, Venezia, Venedig (German), Wenez (in the local dialect), Enetiai (in Greek), and Mleczi, Bnezieh, Mnezik, and Mijetka (in Slavonic). Well-known places may be concealed under some pseudo-classical translation of, or pun upon, the true name; thus, Herbipolis stands for Würzburg; Leucopetra for Weissenfels; Probatopolis for Schaffhausen; Eleutheropolis for Freystadt, Francheville, Francavilla, &c. This latter is a good instance of a difficulty that may arise. Not only may Eleutheropolis represent one of many towns, but from the meaning of the word it has frequently been employed by printers who did not wish to declare the true place of publication. Another instance is Irenopolis ('City of Peace'), which is historically an equivalent of Berea. The following list will be convenient: Argentoratum, Strasburg; Augusta Vindelicorum (often only Augusta), Augsburg; Basilea, Basel; Bipontum, Deux-Ponts; Bononia, Bologna, or Boulogne; Cadomum, Caen; Caesar-Augusta, Saragossa; Cantabriga, Cambridge; Corona, Cronstadt; Dortracum or Dordrechum, Dort; Eboracum, York; Gippesvicum, Ipswich; Grati-anopolis, Grenoble; Hafnia, Copenhagen; Hala, Halle; Holmia, Stockholm; Insula or Insulæ, Lille; Ispalis, Seville; Leodicum, Liège; Lipsia, Leipzig; Lugdunum, Lyons; Lugdunum Batavorum, Leyden; Lutetia, Paris; Massilia, Marseilles; Matisco, Macon; Mediolanum, Milan; Moguntia-cum, Mainz; Mons Regalis, Mondovi; Mussipons or Pontimussum, Pont-à-Mousson; Neapolis, Naples; Neapolis Casimiri, &c., Neustadt an der Hardt; Cenipons, Innsbruck; Olisipo, Ulyssipo, Ulyssipolis, Lisbon; Oxonia, Oxford; Petropolis, St Petersburg; Regiomontium, Königsberg; Rotomagus, Rouen; Sarum, Salisbury; Tarvisium, Treviso; Tornacum, Tournai; Trajectum, Ultra-jectum, Utrecht; Trecæ or Civitas Tricassina, Troyes; Tridentum, Trent; Turoni, Tours. See *Dictionnaire de Géographie Ancienne et Moderne à l'usage du Libraire* (Paris, 1870).

To divert suspicion, printers have often put totally erroneous names on their title-pages: hundreds of European books bear to have been issued at Pekin; thousands of the products of the Parisian presses claim The Hague (La Haye) or some other

Dutch town as their birthplace. Quite recently Burton's literal translation of the *Arabian Nights* bears to have been printed at Benares. In the earlier centuries printing and publication were so much the same thing that to know the place where a book was printed was practically to know where it was published, and *vice versa*. At present it is not uncommon for a work to be printed in one country and published in another. When publishing firms have houses or agencies in different cities, all may be mentioned on the title-page, and precedence accorded rather in keeping with the importance of the cities. Thus, 'London and Edinburgh' frequently appears in books which were entirely produced in the lesser city. With the introduction of stereotype or electrotype plates it has become possible for a book to be printed in more places than one with only one setting-up of type. See Weller, *Die Falschen und Fingirten Druckorte* (1864).

Pagination.—At first the printed book was issued like the manuscript without any numbering of the pages. In the *Sermo ad Populum* (1470) the leaves were numbered; the numbering of the pages followed. In many modern books, when the page contains two or more columns, each column is numbered consecutively. When a book consists of several volumes, each has usually its own pagination; but in some great treatises running through several volumes, it expedites reference from the index to number right through from the beginning to the end of the whole series. In the old folios and quartos letters were not infrequently inserted on the margin, so as to break each page into distinct portions without interfering with the continuity of the text. The marginal letters from the first editions of the classics are often reproduced in modern editions just as they originally stood, and form a convenient method of reference.

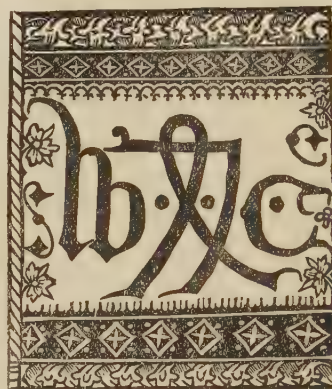
Preface, &c.—The *Preface* is the introductory address of the author, in which he explains the purpose and scope of his book, and, as it were, introduces himself to his readers. Our ultra-Saxonists prefer to call it a 'foreword,' in keeping with the German *Vorwort*. Formerly it was usually headed *To the Reader, To the Gentle Reader, To the Courteous Reader, &c.*

In the times when the professional author depended largely on the patronage of some person of rank, the *Dedication* was an integral and indispensable part of a book. If he made sure of his Mæcenas he could let the many go. At present being for the most part a mere expression of personal esteem or affection, the 'I dedicate' has become as simple in form as in the 17th and 18th centuries it was elaborate with all the rhetorical artifice to which flattery could attain.

Pictorial Imprints or Printers' Devices.—One of the happiest passages in the *Book Hunter* deals with the trade emblems of the old printers. The subject on which it merely touches has been treated at length in such works as Silvestre's *Marques Typographiques* (2 vols. Paris, 1867); Roth-Scholtz's *Thesaurus Symbolorum ac Emblematum, id est, Insignia Bibliopolorum et Typographorum* (Norimbergæ, 1730); Berjeau's *Early Printers' Marks* (Lond. 1866). It is enough here to mention the boldly drawn three-mast ship of Mathis van der Goes, Antwerp (1472-94); the windmill of Andrew Myller, Edinburgh (1508, &c.); the curious wild men and fruit-laden tree of Thomas Davidson, Edinburgh (1541); the olive-tree of the Stephenses; and the sphere of the Elzevirs. In many instances there is a punning allusion to the printer's name: Froschover has his frogs (Frosch in German), and Le Chandelier his seven-branched candlestick; Nicholas Eve gives us a picture of the presentation of the forbidden fruit. Others

make use of the arms of the cities in which they worked. Leeu shows the castle of Antwerp,

R. Hall the half-eagle and key on a shield of Geneva, Stadelberger the lion rampant of Heidelberg and the shield diapered of Zurich, &c. Ascensius (1462-1532) has 'bequeathed to posterity the lively and accurate representation, down to every nail and screw, of the press in which the great works of the 16th century were



Imprint of Caxton.

printed, with the brawny pressman pulling his proof.' His device with the inscription *Preliu Ascensiani* was adopted

by Josse Bade, Paris (1501-35), who added his initials at the foot; by De Gourmont (1507-15); Le Preux (1561-87); and in a modified form by De Marnef (1567) and De Roigny (1565). The anchor and dolphin of the Aldi was employed by Turrisan, De Chenney, Brillard, Tardif, Coulombel, sometimes, as in the last instance, with the divided Aldus.



Imprint of Gaspard Philippe, Paris (1500-10).

Decoration of the Book.—Leaving out of view the pictorial illustration devoted to the elucidation of the subject treated of in a book (see ILLUSTRATION), there are certain forms of illustration which are merely decorative appendages to the book itself. Besides the ornamental treatment of the title-page with peculiar letters, the use of red or blue ink, and the insertion of a printer's emblem or some appropriate vignette, we must mention the engraved title-page (in the 16th and 17th centuries often a most elaborate and costly piece of work), the frontispiece or engraving placed opposite the title-page; ornamental initial letters for chapters; headpieces or vignettes for the blank space generally left before the beginning of a new chapter; and tailpieces at the end of the chapters. By the earliest printers the insertion of decorative details was left to a special artist—the rubricker (so called from the red ink which he mainly employed). Space was often left for his initial letters, and at most only a small letter inserted to guide him.

In describing second-hand books various technical expressions are employed. *Black Letter* is explained in a separate article. *Uncut* means that the

original size of the paper has not been reduced by cropping the edges, not, as is often supposed, that the paper is still in the sheet, a condition for which there is no generally accepted term. The French use *non coupé* in this latter sense, and for 'uncut' *non rogné*. *Foxed* means that a book is damaged by brown or yellow spots. *Curious* is used euphemistically for 'improper.'

See, besides books already cited, Madan, *Books in Manuscript* (1893); Pollard, *Early Illustrated Books* (1893); Duff, *Early Printed Books* (1893); Putnam, *Books and their Authors* (N.Y. 1896); also the articles BIBLIOGRAPHY, BIBLIOMANIA, LIBRARY.

Bookbinding, before the invention of printing and in the days of manuscript Bibles, Psalters, and Books of Hours, was performed largely by monks, who prepared the books up to a certain point ready for ornamentation by the goldsmith and jeweller; and the earliest works from the press were at first printed and bound in direct imitation of these manuscript volumes. Fig. 1 is copied from the side



Fig. 1.

of a Book of Hours bound in the early monastic or Byzantine style, with a figure of Christ carved on an ivory plaque in the middle, surrounded by gold filigree work and sixteen jewels. Gold tooling came from the East, and was introduced into Europe (probably Italy) about the end of the 15th century. It was not till then, when the printing-press had become common in Italy, that binding took rank as an art by itself, and it was probably in the workshops of Aldo Manuzio (Aldus), the famous printer of Venice, that decorative art of the highest character was first applied to the ornamentation of book-covers. There are in the National Library at Paris books bound for an Italian connoisseur named Tommaso Maioli, and for another celebrated bibliophile, Jean Grolier of Lyons (1479-1565), which are unsurpassed in beauty of design and workmanship at the present day. This taste for artistic bookbinding soon spread to France, where the king and the richer among the nobility vied with each other in the possession of handsome bindings. Louis XII. and his queen, Anne of Brittany, both possessed fine examples, probably of Italian workmanship. Henri II. and Catharine de' Medici were perhaps the most enthusiastic royal patrons of the art, and the king's favourite, Diana of Poitiers, had probably the finest collection of splendidly bound books that was ever got together. Henri III., who was also a

great lover of books, was afflicted with a peculiar mania for all kinds of emblems of death, and carried it so far as to cause the well-known death's head and cross-bones to be introduced on his bindings; it thus became very easy to recognise volumes which had once formed part of his library. Jacques Auguste de Thou (Thuanus), president of the parliament, and a great friend of Grolier, was another celebrated collector of sumptuously bound books of this period.

Nicholas and Clovis Eve were celebrated royal binders of the latter part of the 16th century; to both of these have been attributed, but on insufficient data, the introduction of the style known as *fanfare*, with geometrical patterns filled in with sprays of leaves, palm branches, and other foliated forms.

In the early part of the 17th century we meet with the name of Le Gascon, probably the by-name of Florimond Badier, whose work merits great praise. The peculiarity of his ornament, known as *pointillé*, consists in filling in a geometrical outline with innumerable minute gold dots, often thus forming very pleasing patterns. During this century Macé Ruette and Luc Antoine Boyet were royal binders of note. In the early 18th century the most famous workmen of the craft were Duseuil, Padeloup, and Derôme, who faithfully carried on the tradition of their predecessors. A famous binding attributed to Nicolas Padeloup is that figured in our engraving (fig. 2), a *Daphne et*



Fig. 2.

Chloe of 1718, with the arms of the then regent of France, the Duke of Orleans.

During the 19th century bookbinding continued to preserve its rank as a fine art, especially in France, where the most elaborate work, executed with the greatest care and skill, is more sought for than in other countries.

Germany and the Netherlands are remarkable for their ornamental leather bindings, pigskin and calf being the favourite leathers. The earlier bindings were ornamented in 'blind' (i.e. without gold), either by cutting designs on the leather or stamping it with dies, rolls, or panel stamps, showing portraits of historical persons and allegorical figures. The art of gold tooling was introduced into Germany about 1530, but it never became as popular as it did in Italy, France, and England, and German gold-tooled bindings have never reached a high standard of excellence.

England, at the end of the 12th century, was

foremost as regards stamped leather bindings; these were ornamented in 'blind' by impressing on the leather small dies of various shapes and designs. Some important binders whose names have survived are: Julian Notary, in the reign of Henry VII.; Thomas Berthelet (who probably introduced gold tooling into England), John Reynes, and Nicolas Spierinck, in the time of Henry VIII.; John Gibson, of Edinburgh; Nicholas Ferrar and the 'Nuns' of Little Gidding, who produced the remarkable 'Harmonies' of the Scriptures; and Samuel Mearne, famous for his 'cottage' patterns, which resemble a cottage gable, in the 17th century; Eliot and Chapman, who bound the library of Robert Harley, Earl of Oxford, in the style now called the 'Harleian,' and Roger Payne (the most famous English binder), in the 18th century. Baumgarten, Benedict, Kaltheober, Staggeimeier, and Walther carried on the tradition of fine binding, and they were succeeded by other excellent binders, such as Hering, Lewis, Bedford, Riviere, and Zaehnsdorf. At the present day there are binders whose names will go down to posterity amongst those of the most celebrated craftsmen.

Bookbinding may be divided into two main classes—viz. 'bound' work, which is effected by hand labour, and 'cased' work, which is produced almost entirely by machinery; the essential difference being that the boards of a 'bound' book are secured to the book before the covering material is attached, whereas the cover of a 'cased' book is made separately and then simply pasted to the sides.

In hand work, if the binder receives the books in sheets, the first operation is folding; usually sheets are folded three times, producing *sections* of sixteen pages. At the foot of the first page of each sheet (see PRINTING) is a letter or figure, called its *signature*; the first sheet of a book is A or 1, the second B or 2, and so on. After the sheets are folded, complete books are obtained by 'gathering' a section off each of the various piles, which are arranged in proper order. The separate books are collated or examined to see that the signatures are in their correct sequence. They are then pressed to give them solidity, the end-papers are attached to the first and last sections, and the books are ready for sewing. There are several methods of sewing: (1) 'flexible' sewing over raised bands, (2) sewing on cords which are sunk in saw cuts in the back of the sections, (3) sewing over tapes, (4) overcasting (or whipstitching), if they consist of single leaves. In hand-sewing cords or tapes are stretched on a sewing frame, and the sewer passes a threaded needle in and out of each section in such a manner that the thread goes round each cord or tape; when a book is sewn it is cut from the frame so as to leave about two inches of cord or tape on either side. It is then taken to the *forwarder*, who glues the back, and, when nearly dry, rounds it by the aid of a backing hammer; the book is then placed in a press between backing boards, and grooves (into which the boards are to fit) on either side are formed by striking the back dexterously with a hammer. If the book is sewn on cords they are laced to the boards, and the ends pasted and hammered down; if sewn on tapes, they are usually inserted between 'split' boards. The edges are then cut with a 'plough,' and ornamented by marbling (a separate industry), gilding, or sprinkling with colour. Headbands are afterwards affixed to the head and tail of the book; if these are worked on they strengthen the book. If the book has been sewn on the sawn-in method and is to have a 'hollow back,' the back is lined with strong paper, and the back is not attached to the covering material; but if the book is to have a 'tight back' the leather cover is glued directly to the back. In

covering the book the edges of the leather are pared thin, and the whole is covered with paste. The leather is drawn over the back and sides, and turned over the boards, and the end-papers are pasted down. The work is then handed over to the *finisher* for tooling. He prepares the leather by washing it with paste-water, and afterwards applying *glair*, made of the white of egg, on which gold-leaf is laid. The lettering and ornamentation are effected by heating the hand tools over a gas stove, and impressing them on the work, whereby the gold is made to adhere; the superfluous gold is afterwards rubbed off with a piece of soft rubber, and the book is finished. Books covered entirely with leather are known as 'whole bound'; 'half-bound' is applied to a book having a leather back and corners, and the sides covered with cloth or paper; 'quarter-bound' books have leather backs only, and cloth or paper sides. 'Limp' books have thin, flexible covers. 'Roxburghe binding' is quarter-binding in straight grain roan or morocco, with coloured paper sides; generally the top edge is gilt.

In England cloth is generally used for edition binding, but on the Continent publishers usually issue their books with paper covers. Cloth for the covering of books was introduced in 1822 by Pickering the publisher, and Leighton the binder.

For folding sheets for edition binding there are ingenious machines for making various folds, some of which have automatic feeders. After the sheets are folded, the plates and maps are tipped (i.e. pasted) to their respective sections, and the end-papers attached by a machine to the first and last sections of the book. 'Gathering' is performed by piles of the sections of the book being placed in a series of boxes on a machine, and the sections for a complete book are delivered automatically on to an endless band. The books, after being collated, are sewn by one of the various book-sewing machines. Machine-sewing may be plain, through mull, through or over tapes, and over cords. After being sewn, the books are made compact by being pressed in a smashing or nipping machine, the backs are glued to hold the sections together, and then the edges are trimmed by a cutting machine, of which there is an almost endless variety, some having only one knife, others having two, and others having three. Glue is now applied to the back; and, when nearly dry, the books are rounded and backed by a machine, the operator simply feeding each book between a pair of rounding rollers. The back is again coated with glue, and a strip of mull and paper are attached. As soon as the books are dry, they are ready to have a complete cover or 'case' attached, which is generally made entirely by machinery. Case-making machines automatically glue the cloth, apply the boards and back lining, and turn in the edges of the cloth, thereby making a complete cover. Cloth book-covers may be decorated by blind stamping, embossing, stamping in gold or alloyed metals, or printing in colour, or by a combination of some of these processes. For blocking in blind or in gold, or for printing in colour, dies or blocks cut in relief are required; for stamping in relief, a die of hardened brass, cut in intaglio, and a counter die are necessary. Most of the blocking machines work in similar manner: the block is fixed to an upper plate, under a heating-box; the cover, after having had the gold-leaf laid on, is placed on the lower plate, and it is then brought into contact with the heated die, which gives the impression and fixes the gold-leaf. The superfluous gold-leaf is afterwards rubbed off, leaving only the ornamentation. Colour work is done without heat. Great attention is now paid to the designing of book-covers and end-papers, a separate school of book-cover designers having

arisen, and famous artists, such as Walter Crane and Sir Hubert von Herkomer, have devoted their talents to this work. The book and its cover are now combined—an operation termed 'casing-in.' The casing-in machine applies paste to either side of the book, and automatically places a cover over it, and the book is afterwards removed by the operator, to be consigned to the hydraulic press, in which books are stacked for a few hours, after which they are ready.

Magazines and similar books, consisting of several sections, are generally secured by clamping two or three wire staples through the side by means of a machine; but there is also a machine that binds them, by first cutting the sections into single leaves, then glueing them and applying a strip of mull, and finally attaching a paper cover. Pamphlets, forming a single section, are generally stitched by a wire-stitching or a thread-stitching machine; the latter makes the holes, draws the thread through them, ties a tight reef-knot, and cuts the thread.

There are several other branches of binding in which some binders specialise, such as 'Bible work' (including prayer-books), public library binding, and 'stationery binding,' the latter being concerned with the binding of account-books.

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Book Cliffs, the brilliantly coloured escarpment of the Book or Roan Plateau in Colorado and Utah.

Book-club is either (1) an association for purchasing and reading new books as they issue from the press, or (2) an association for the printing of books relating to some special branch of inquiry. The importance of the former kind of book-club has greatly diminished in Britain since the general establishment of circulating libraries after the style of Mudie's in London. The present article deals with the printing book-club only. The oldest is the Cymmrodorion or Metropolitan Cambrian Institution, founded in 1751, and reconstituted in 1820, and again in 1877. The still earlier Dilettanti Society (1734) is also a kind of book-club, its *magnum opus* the *Antiquities of Ionia* (4 parts, 1769-1882). But the practical prototype of the true book-club was the Roxburghe, instituted (17th June 1813) in commemoration of the sale of the Duke of Roxburghe's library, and more especially in honour of the Valdarfer *Boccaccio*. At first the club was largely convivial, its dinners costing sometimes £5 or £6 a head; though it was understood that each member was to be at the cost of reprinting as many copies of some scarce work as there were members in the association—the chairman's copy to be on vellum. The first issues were quite trivial; and the solid work of the club began only with Sir Frederick Madden's *Romance of Havelok the Dane* in 1828. It was the Bannatyne Club (q.v.), founded by Sir Walter Scott in 1823, which began the regular issue of really substantial productions. The Camden Society introduced the method, now universal, of taking an annual sub-

scription from each member, instead of leaving the whole expense of a book to be defrayed by one individual; and thus, among other advantages, secured a more equal standard of excellence. Omitting learned societies which publish only Proceedings and Transactions, the following is a brief list of the more important book-clubs and book-printing societies of Great Britain: Maitland Club (Glasgow, 1828-59), after Sir Richard Maitland of Lethington, works illustrative of Scottish history, antiquities, and literature; Oriental Translation Fund (1828-58); Iona Club (Edinburgh, 1833-38), history, antiquities, and early literature of Scottish Highlands and Islands; Surtees Society (Durham, 1834), after Robert Surtees of Mainsforth, manuscripts dealing with the Northumbrian region; Abbotsford Club (Edinburgh, 1834-37), history, literature, and antiquities, English and Scottish; Camden Soc. (Lond. 1838), civil, ecclesiastical, and literary history of the United Kingdom; Spalding Club (Aberdeen, 1839-70; revived 1887), after the local historian, literature of north-eastern counties of Scotland; Parker Soc. (Lond. 1840-55), after Archbishop Parker, the fathers and early writers of the Reformed English Church; Percy Soc. (Lond. 1840-52), after Thomas Percy, ballad poetry; Shakespeare Soc. (Lond. 1840-53); Soc. for the Publication of Oriental Texts (Lond. 1841-50); Elfric Soc. (Lond. 1842-56), Anglo-Saxon works; Chetham Soc. (Manchester, 1843), after Humphrey Chetham, works connected with Counties Palatine of Lancaster and Chester; Sydenham Soc. (Lond. 1843), medical literature; Spottiswoode Soc. (Edin. 1843-51), authors of the Episcopal Church of Scotland; Ray Soc. (Lond. 1844), natural history; Wernerian Club (Lond. 1844), scientific works; Cavendish Soc. (Lond. 1846), chemical science; Hakluyt Soc. (Lond. 1846), geography and travel; Arundel Soc. (Lond. 1848), important works of old masters; Early English Text Soc. (1864); Spenser Soc. (1867-68); Holbein Soc. (Lond. 1868), illustrated works; Ballad Soc. (Lond. 1868); Chaucer Soc. (1868); Harleian Soc. (1869), historical; English Dialect Soc. (1873); New Shakespeare Soc. (1873); Folklore Soc. (Lond. 1877); Index Soc. (1878); Wyclif (1882); Palæographical and Pipe Roll Soc. (1883); Palestine Pilgrims Text Soc. (1884); Scottish Text Soc. (Edin. 1883); Scottish History Soc. (Edin. 1886). Among the many similar societies in the United States, the oldest is the Massachusetts Historical Society (Boston, 1792). See Burton, *Book Hunter*; Martin, *Bibliogr. Cat. of Books privately printed* (1834); Hume & Evans, *Learned Societies and Printing Clubs of the United Kingdom; English Catalogue* (Appendixes); Bohn, *Appendix to Lowndes' Bibliographer's Manual* (1864); Growoll, *American Book Clubs* (N.Y. 1897); and the *Yearbook of Learned Societies*.

Book-keeping is the art of recording commercial and financial transactions in a regular and systematic manner. Its object is to preserve a distinct and accurate record of such transactions, and from a well-kept set of books a merchant should be able to ascertain at any time the state of his account with any person with whom he has dealings, and the profits or losses resulting from each venture or department of his business, his assets and liabilities, and the exact state of his affairs. The stability of a business depends to a very large extent upon the accuracy of the information thus conveyed, for without it, the trader, in ignorance or with only a vague idea of his true position, often proceeds upon wholly erroneous and inflated ideas of his resources, and is only awakened to the real state of matters by the impossibility of meeting his liabilities when they fall due. Many a bankruptcy may be traced directly to the

errors and confusion arising from neglect or carelessness in this department. But these considerations are far from being universally realised and acted upon by business men. Among the class of small traders especially, the time required for keeping books in proper order is grudged as being unremunerative, and the work, if done at all, is performed in a careless and inefficient way, frequently with the disastrous results above referred to. The necessity of keeping proper books has been recognised by the legislature. The Debtors Act (Scotland), 1880, contains provisions for the punishment of bankrupts who have failed to keep satisfactory books, and the English Bankruptcy Act (1883) has a similar clause. A merchant's books frequently constitute important evidence in a court of law, and they should for this reason, if for no other, be kept as neatly and carefully as possible; the presence of blots, deletions, and erasures, or the tearing out of pages, will render them liable to suspicion, and greatly lessen their value in this respect.

It is probable that at a very early period, so soon as trading transactions became too involved to be readily borne in mind, means would be found to keep some record of them. Thus we read in the Book of Ecclesiasticus (chap. xlii. 7), 'put all in writing that thou givest out or receivest in;' and excavations in Babylon have brought to light the records of a great banking-house inscribed upon the bricks or tiles which served the purpose of books. From certain passages in Cicero and Pliny it seems evident that the Romans understood something of *Debit* and *Credit*, so far, at least, as to make entries falling under these terms upon opposite pages. As an art, however, book-keeping appears to have arisen in the great mercantile cities of Italy during the 15th century, and the principles of double entry (*doppia scrittura*), under the name of 'the Italian method,' gradually spread over Europe, many languages still retaining the original Italian names as technical terms.

The earliest treatise, so far as known, on the subject was contained in an algebraic work by a friar named Luca Pacioli, which was published at Venice in 1494. The first work in English was Hugh Oldcastle's *Profitable Treatyce*, published in London in 1543. E. T. Jones's *English System of Book-keeping* (Bristol, 1796) was long regarded as of supreme authority, and went through a score of editions. It was in reality a modified form of the Italian double entry.

Blunders and confusion frequently arise from the attempt to follow slavishly definite rules without an intelligent knowledge of their meaning, a comprehension of the general principles being much more important than a strict adherence to any particular style however excellent. It may fairly be said that a just appreciation of the terms *Debtor* and *Creditor*, which, abbreviated to *Dr.* and *Cr.*, are usually placed at the top of the left and right hand respectively of every account, affords a master-key to the whole subject. A person, or his account, is regarded in book-keeping as *debtor* for what he *receives*, and *creditor* for what he *gives*. Thus the value of goods sold to a person, or cash paid to him, is placed to the *debtor* or left-hand side of his account, while cash or goods received from him are entered on the *credit* or right-hand side.

The details of book-keeping vary largely according to the nature and extent of the transactions which are to be recorded. Thus the shopkeeper's books differ from those of the great wholesale merchant, and these again from the books of banks, public companies, and government departments; but the same general principles underlie all, and

when once these are well mastered, they may, with the exercise of a little intelligence and ingenuity, be applied to every emergency.

There are two kinds of book-keeping in general use—SINGLE ENTRY and DOUBLE ENTRY. In the first of these, the only accounts kept in the ledger are those of the persons with whom there are dealings, and a statement of affairs is arrived at by adding together the debts due to the trader, and those due by him. To the former is added the value of any stock-in-trade or other property he may have, and the excess of these *assets*, as they are called, over the liabilities, is the amount of his *capital*. By comparing this figure with his capital at the last balancing date, and taking into account any sums he may have paid into or withdrawn from the business, he estimates his profit or loss for the period. But this is a manifestly crude and imperfect system, and most traders, even though they may not adopt double entry in its fullest and most elaborate form, import more or less of its principles in order to have some check upon the accuracy of their balance sheet and to gain information as to the details of their business.

Double entry is the true art of book-keeping, and it completely fulfils the requirements of clearness, completeness, and accuracy. Its theory is founded upon the obvious fact that every commercial transaction has two sides: if it is a *giving* by one person, it must be a *receiving* by another. Thus every sale involves a purchase, every debtor must have a corresponding creditor, and every creditor a debtor, and the double-entry system derives its name from recording both sides of each transaction. If an entry is made to the credit of any account in the ledger, there must be a corresponding entry to the debit of some other account. In this way the two sides of the ledger must always agree, or balance one another, and their failure to do so discloses the presence of an error—e.g. if a merchant buy a quantity of calico of the value of £50 from the manufacturers, A. B. & Co., he will place £50 to the *credit* of A. B. & Co.'s account, and the same sum to the *debit* of 'calico' account, which represents himself as the receiver. In the same way, if the calico is afterwards sold to C. D. & Co. for £60, that sum will be placed to the *debit* of C. D. & Co.'s account, and to the *credit* of 'calico' account. Many are deterred from adopting the double-entry system by an exaggerated idea of its complexity and laboriousness; and it would no doubt be most unwise for a tradesman with a small business to plunge into the most elaborate form of the system. But if his books are accurately kept by single entry it is possible to convert them yearly or periodically into double entry with very little trouble. This is done by casting up the purchases, sales, and expenses for the period, from which a goods account and profit and loss account can be constructed. Thus the principle of double entry is carried out, though roughly, and its check taken advantage of without multiplication of books, accounts, or labour.

The same books are used in both systems except the journal, which is peculiar to double entry, and a brief description of the most important books which would be kept by an ordinary merchant will serve to exemplify the general principles of book-keeping.

Day-book, or Sales-book.—This book contains a daily record of all goods sold. Under each day's date should be stated the name of the purchaser, and a full description of the goods—their quality, quantity, and the rate. If several items are sold to the same person on the same day, the various items are usually stated in an inner column, and the total amount extended to a second column.

Where this is done, a test of the accuracy of these additions is obtained by adding up both columns, the total of which ought of course to be the same. Cash sales—that is, goods paid for at the time of purchase—may be entered in one sum at the close of each day.

The *Invoice-book*, or *Purchase-book*, keeps a similar record of all purchases. It is written up from the invoices or accounts sent along with all goods received, and the invoices themselves are preserved either in files or by pasting them into a book called a *Guard Invoice-book*.

Cash-book.—In this very important book, all receipts and payments of cash are recorded from day to day. The two opposite pages of the book are used concurrently, the receipts being entered on the left-hand or debtor side, and the payments on the right-hand or creditor side. It is thus in form simply an *account current* between the cashier and his employers, all money received by him being placed to his debit, and all disbursements to his credit. On the two sides being summed up, the excess of the total receipts over the disbursements, called the cash *balance*, is the sum for which the cashier is accountable, and should agree with the cash actually in his till. This test should invariably be applied every day, as an error or omission becomes more difficult of detection the longer its discovery is delayed. Payments by means of cheques on the banking account, though they do not affect the actual cash on hand, are usually entered as disbursements on the creditor side, while a corresponding entry for the same amount, as if received from the banker, is made on the debtor side. It is also usual to have a separate column in which the discounts or abatements on each account paid or received are noted. The cash-book is also sometimes provided with several cash-columns on either side, so that transactions of the same kind may be collected together and added up separately. Thus the debtor side may be divided into bank entries, bills receivable, &c., and the creditor side into bank, bills payable, wages, charges, &c., the total in each case being extended into the last column.

Bill-book.—This book is a record, in the order of their date, of all bills receivable or payable by the firm, a separate book being usually kept for each. It should contain appropriate space for such particulars as—number of bill, date, name of drawer, indorser, and acceptor, currency and due date, amount, when and how paid or disposed of. See article **BILLS OF EXCHANGE**.

Journal.—The journal may be called the master-book of the double-entry system. It contains an abstract or synopsis of all the other books, the whole of the transactions being here digested under proper heads so as to facilitate their transfer to the appropriate accounts in the ledger. By the old Italian system, debit and credit entries were made in the same column of the journal, but the modern journal has two columns in each page, the first for debit and the second for credit entries, corresponding to the *Dr.* and *Cr.* sides of the ledger accounts. As the ledger contains precisely the same entries as the journal, though differently arranged, the summation of the columns of the latter for a given period should, unless a mistake has occurred, exactly agree with the aggregate of either side of the former. The subsidiary books are usually journalised, or abstracted into the journal, monthly. The strict rules of double entry require that no entry should be made in the ledger except from the journal, but to save time and labour the cash-book is often posted direct, the monthly totals only being passed through the journal, and some follow the same plan with the day-book and invoice-book. All sorts of cross

entries, or transfers from one account to another, must be made by means of the journal, which shows clearly where the corresponding entries are, and how the equilibrium of debtor and creditor is preserved.

Ledger.—The ledger (called in Fr. *grand livre*) is the most important of all the books. It exhibits under distinct headings the accounts of all persons with whom the merchant has dealings. It also contains accounts for every description of property and for outlay, such as wages and general expenses not chargeable to particular accounts. Here will ultimately be found, in a tabulated form, the contents of all the other books, the debits being on the left and the credits on the right hand side of the account. It has been already explained that in double entry all these entries should be posted from the journal, and that no entry can be made on either side of any account without a corresponding one being made on the opposite side of some other account. To balance a ledger, accordingly, the book-keeper must take down on a sheet of paper, or book for the purpose, the total sums on the debtor and creditor sides respectively of all the accounts. This is called a *Trial Balance*, and if the two sides agree, the accuracy of the work is demonstrated; if not, he must examine the transfers and additions till the error is discovered. This done, the balances of the various accounts instructing the gains and losses or expenses of the business are transferred by journal entry to *profit and loss* account, and the balance of that account in turn is carried to *capital account* or divided among the partners if there be more than one. The remaining accounts are then closed by transferring their balances to balance account; and the books are reopened for another period by a reversing entry bringing down the balances thus transferred to start a new account. A *Balance Sheet* is a statement of the merchant's affairs, and exhibits on the one side his whole assets, stock-in-trade, debts outstanding, property and furniture, and cash in bank or on hand. On the other side are his liabilities and his capital, which is just the excess of the assets over the liabilities. The following is a specimen of a balance sheet of the simplest description:

Balance Sheet of George White, Grocer, London, as at 31st December 19—.									
Dr.					Cr.				
	£	s.	d.			£	s.	d.	
To Sundry Creditors	1004	11	7	By Stock-in-trade	1285	3	8		
" Bills Payable	256	18	9	" Sundry Debtors	1281	9	6		
" George White,				" Bills Receivable	173	11	10		
Capital a/c	1889	5	3	" Warehouse Fur-					
				niture	125	15	0		
				" Cash at Banker's	273	11	5		
				" Do. on hand	11	4	2		
	3150	15	7		3150	15	7		

Besides the books enumerated, others of a subsidiary kind are kept by most merchants, as a *Return Book* for goods returned by or to him, an *Order Book* where all orders are promptly noted, a *Warehouse Book* to keep account of all stock entering or leaving the warehouse, a *Package or Case Book* for barrels, cases, &c. to be returned, and *Account Sales Book*, showing the net proceeds of each cargo or consignment of goods, a *Letter Book*, and many others. The ledger is frequently, for convenience, kept as two or three separate books—Sales Ledger, Purchase Ledger, and Private Ledger—but they must, for balancing purposes, be considered as forming parts of one whole. In extensive businesses, each branch or department may have separate books of its own, the whole being brought to a general balance at periodic times.

The development of modern book-keeping is entirely in the direction of greater simplicity and clearness, and the avoidance of unnecessary labour

in transcription. Thus the journal has been practically abandoned in commercial book-keeping, the entries being posted directly to the ledger from the cash-book or day-book. Even the ledger is often supplanted by alphabetically arranged cards, on which the various accounts are inscribed.

The general principles of book-keeping have not been and probably will never be altered; but it must be borne in mind that no system, however perfect, will make up for slovenliness or carelessness on the part of the book-keeper, or for want of due oversight on that of the employer. The utmost regularity, vigilance, and honesty are required to avoid snares and fallacies, and there are some errors which the most elaborate book-keeping will not detect, but in some cases even help to conceal.

Book-keeping is taught in our schools as one of the branches of a commercial education; but of no subject can it be said with greater truth that a pinch of practice is worth a peck of theory. The bibliography is very extensive, and there are hand-books with specialised forms of book-keeping suitable for every trade and profession. For the history of the subject see Brown's *History of Accounting*. Among text-books of a general nature may be mentioned those of Carter, Inglis, Pitman, Cropper, Dicksee, Spicer and Pegler, and Jenkinson.

Bookland. See BÓCLAND.

Book-lice, various small animals which damage books. (1) Thus in the family Psocidæ, in the order Orthoptera, there are numerous minute wingless insects which shelter in books and among papers, and do especial damage to collections of insects. One of them (*Atropos pulsatorius*) was long credited with being the Death-watch. The closely allied *Troctes divinatorius* is a yet commoner pest of entomological cabinets. See DEATH-WATCH.—(2) Among beetles, too, in the wood-boring family, Xylophaga, *Ptilinus pectinicornis* is known to attack books with wood in the binding. See the article BORERS.—(3) Very different are the book-scorpions (Cheliferidæ) in the spider class (Arachnida). See BOOK-SCORPION, BOOK-WORM.

Book-making. See BETTING.

Book of the Dead. See DEAD (BOOK OF THE).

Bookplates. This is the somewhat awkward English name for labels of ownership frequently placed on the inside covers of books. Abroad these labels are styled *ex libris*. The use of bookplates is of some antiquity, and mention has been made of one dated in the middle of the 15th century, but at present the fine bookplates of Bilibaldus Pirckheimer (1470-1530), designed by Albert Dürer, hold the foremost place in point of time. Engraved English bookplates are not found of so early a date, but an old folio volume from Henry VIII.'s library, now in the British Museum, contains an elaborately emblazoned drawing which formed the bookplate of Cardinal Wolsey, with his arms, supporters, and cardinal's hat. The earliest English engraved bookplate at present known is that of Sir Nicholas Bacon, father of Lord Chancellor Bacon, which is dated 1574. The number of English examples dated previous to the Restoration which have come down to us are singularly few, but after this period the series is well represented, and some of these plates are of considerable historical interest. Samuel Pepys had several bookplates; those with his own portrait could not have been engraved before 1685, because he is described therein as Secretary to the Admiralty under Charles II. and James II., but the one with his initials and the crossed anchors

was probably engraved as early as 1668. The bookplate of Pepys's faithful friend, William Hewer (in whose house at Clapham the diarist died), is dated 1699. The date on the plate of the well-known alderman and Lord Mayor, Sir Robert Clayton, is 1679. The names of Bishop Burnet, William Penn, Robert Harley, Matthew Prior, Lawrence Sterne, David Garrick, Horace Walpole, John Wilkes, and Charles James Fox, may be mentioned among those found on the highly prized bookplates of the collectors.

The styles of design adopted by book-collectors for their bookplates have been very diverse. Some of these labels have contained merely the name of the possessor, but the majority are armorial, some are allegorical in design, and others are ornamented with miniature landscapes. Many distinguished artists have condescended to produce bookplates. The name of Albert Dürer has already been mentioned as the designer of Pirckheimer's two plates—one in which the allegorical and the armorial elements are united, and the other consisting of a large and bold portrait of the once celebrated senator of Nuremberg. Of English engravers, William Marshall and Robert White may be specially mentioned. Hogarth engraved a bookplate for John Holland, heraldic artist, and another for George Lambert the scene-painter. George Vertue and Thomas Worlidge also produced bookplates, and Thomas Bewick was at one time fully employed in their production. One of the prettiest of bookplates is that designed by Agnes Berry in 1793 for the Hon. Mrs Damer. This was engraved by Francis Legat. The earliest bookplates were of large size, as if made specially for folios, but a smaller size soon became general, a size which was used for both large and small books. Sir William Stirling Maxwell used a variety of sizes for differently sized books, and some of these bookplates were of gigantic proportions. The fashion of collecting bookplates is a very modern one, and not many years ago, while a label of special interest might be retained in a book, in most instances the bookplate of the latest owner was placed over that of the former one. The craze for collecting bookplates, apart from the books they once adorned, has little to be said in its favour.

In 1837 the Rev. Daniel Parsons published an article on bookplates in the *Third Annual Report of the Oxford University Archeological and Heraldic Society*, and in 1851 he announced his intention of writing a history of bookplates, but this work was never produced. The Hon. J. Leicester Warren (Lord de Tabley) published in 1880 the first English work on the subject (*A Guide to the Study of Bookplates*; new ed. 1900), and in 1884 Griggs printed privately a very small edition of a work entitled *Eighty-three Examples of Armorial Bookplates*. See also, among others, the following works: Egerton Castle, *English Bookplates* (1893); Walter Hamilton, *French Bookplates* (1893); Poulet-Malassis, *Les Ex-libris Français* (2d ed. 1875); Dexter Allen, *American Bookplates* (1895); Vinycomb, *The Processes for the Production of Ex-libris* (1894); Sauler, *Art in Bookplates* (1895); Count zu Leiningen-Westerburg, *German Bookplates* (1901); and the 'Ex-Libris' Series.

Book-scorpion (*Chelifer*

cancroides), a small Arachnid, in appearance between scorpion and mite. It is like a small flattened scorpion without a tail. The front of the body is scorpion-like, and bears a transverse dorsal groove; the posterior body is flat, with 10 or 11 rings. There are two eyes; the respiration is by means of air-tubes; the eggs are



Book-scorpion.

carried about on the abdomen of the female. Spinning-glands are present, and the body is sometimes covered by the secretion. The size is about one-eighth of an inch, the colour brownish. The book-scorpion lurks among old books and papers, and probably helps their preservation by killing off and eating book-lice, mites, and other small insects. Upon the whole it likely does more good than harm. Other related forms are common under bark, moss, &c. Some species are found attached to the legs of house-flies, which not improbably indicates a partial parasitism. See ARACHNIDA, BOOK-LICE, SCORPION, SPIDER.

Book-trade. The business of dealing in books comprehends three classes of traders—Publishers, who prepare and dispose of books wholesale; Wholesale Booksellers, who distribute books to retail dealers; and Retail Booksellers, who sell books to the public. The latter class may again be divided into dealers in new books, in second-hand books, and in periodicals. Although ordinarily distinct, these classes may conveniently be treated together. While publishing apart from bookselling is of modern date, the selling of books is as old as the origin of literature. Manuscript copies of the works of authors were sold in the ancient Greek cities and in Rome. The first book of Martial's epigrams was to be had for an English equivalent of about three shillings; his other books for less. Slave labour was employed in transcription; and there were men who employed copyists and sold their work. Horace celebrates 'the brothers Sosii' as eminent booksellers (*bibliopole*). In the middle ages the monks of various monasteries were in the habit of bartering the books they transcribed. But books were rare and costly because of the ignorance and the apathy of the public. With the foundation of several universities in the 12th century, the preparation and sale of books increased; but the trade of bookselling attained to importance only after the invention of printing. The first booksellers were also book-lenders, under the control of the universities. In 1292 the book-trade of Paris consisted of 24 copyists, 17 bookbinders, 19 parchment makers, 13 illuminators, 8 dealers in manuscripts; the last had increased to 29 in 1323. The business was more in lending than selling. Students at the English universities bought their books or received them on loan from the 'sworn stationers.' Some of the French kings and princes of the royal blood were liberal patrons of authors and all engaged in the production of books. Philippe, Duke of Burgundy (1396-1467) gave constant employment at Bruges to a host of authors, translators, copyists, and illuminators.

The first printers acted also as booksellers, and being mostly learned men, they were generally the editors, and, in some instances, the authors of the works which they produced. The manufacture of books had become such an important item of commerce that at Bruges (1454) and Antwerp (1450) a guild of booksellers, copyists, and allied trades was formed (see PRINTING). Fust and Schöffer, the partners of Gutenberg (q.v.), carried the productions of the Mainz press to the fair of Frankfort-on-the-Maine and to Paris. Some instances of division of the two branches, printing and bookselling, occurred in the 15th century. The founder of the Stephens (q.v.) family of printers and publishers had settled in Paris in 1502; Louis, the first of the Elzevirs (q.v.), was settled as a bookseller and bookbinder in Leyden in 1580. The press established by Aldo Manuzio, during one hundred years (1490-1597), printed 908 different works (see ALDINE EDITIONS). Plantin (q.v. 1514-89) of Antwerp had sometimes twenty presses at work.

Migrating from place to place, and resorting to the great continental fairs for customers, the early booksellers became known as *stationarii*, or stationers—i.e. occupiers of a 'stance' or station at a fair. The first stationers in England seem also to have engrossed what they sold. Caxton and Wynkyn de Worde chiefly issued translations. The Reformation caused a great demand for Bibles. The pedlars who frequented the country fairs were of some importance in the early days of bookselling. It was a common thing for government, in the 16th century, to enforce the printing of restrictions as to price on the last page of a book. The number of readers was but small, and in 1540 Grafton printed only 500 copies of his complete edition of Scripture. There exist 326 editions of the Bible or parts of the Bible printed between 1526 and 1600. Ames and Herbert record 350 printers at work in England and Scotland (1476-1600); at least 10,000 distinct works were printed during that period. The British Museum has a collection of over 2000 volumes of Tracts all relating to the period of the first English Revolution from 1640 to 1660, which include 30,000 separate publications. This was the era of the controversial pamphlet. Dr Johnson has remarked that from 1623 to 1664 the nation was satisfied with two editions of Shakespeare. The stock of books in sheets lost by the booksellers around St Paul's in the great fire of 1666 was of an estimated value of £200,000.

Whether settled or migratory, the early booksellers were subject to many restrictions. In England, the book-trade was trammelled by royal patents and proclamations, decrees and ordinances of the Star Chamber, licenses of universities, and charters granting monopolies in the sale of particular classes of works. In 1557 the Stationers' Company of London was constituted by royal charter, and exercised an arbitrary censorship of the press. The Crown, by an Act 13 and 14 Car. II. chap. 23, commonly called the 'Licensing Act,' assumed this species of control over the issue of books. The Licensing Act, and its renewals, ultimately expired in 1694. By the first Copyright Act, 8 Anne, chap. 19, the legislature interposed to protect the rights of authors, and to relieve them, as well as publishers, from the thralldom of the Stationers' Company. But by the same act, the Archbishop of Canterbury, the Lord Chancellor, and certain judges in England, and the judges of the Court of Session in Scotland, were empowered, on the complaint of any person, to regulate the prices of books, and to fine those who sought higher prices than they enjoined. This provision was in force till 1738, when it was abolished by the Act 12 Geo. II. chap. 36. From this time the book-trade was free.

Many of the bibliopoles who flourished in the 17th and 18th centuries have been rendered famous, not less by their enterprise and vigour of mind, than by association with the authors and wits of the period. Thomas Guy (1644-1724) is remembered in connection with the Bible-trade, and as the founder of Guy's Hospital; Cripps, the publisher of the seven folio editions of Burton's *Anatomy of Melancholy* (1621-76), according to Wood, 'got an estate by it;' John Dunton's (1659-1733) name has been preserved by Swift, and he is notable as one of the first men the Pretender purposed to hang at Tyburn, if ever he ascended the British throne, 'for having writ forty books to prove him a Popish impostor;' Jacob Tonson (1656-1736), Dryden's publisher, and satirised by the poet, was the first to popularise *Paradise Lost* and Shakespeare; Lintott (1675-1736) enriched himself and Pope with editions of the *Iliad* and *Odyssey*; Curll (1675-1748) was pilloried not only by the govern-

ment, but by Pope in his *Dunciad*; Richardson (1689-1761) was both novelist and printer; Johnson, who wrote the life of Cave (1691-1754), said Cave 'scarcely ever looked out of the window but with a view to the improvement of his *Gentleman's Magazine*.' Of the publisher of Thomson, Fielding, and Hume, he also said, 'I respect Millar, he has raised the price of literature.' One of the Newberys, bookseller and medicine vendor, was associated with Goldsmith, and is spoken of in the *Vicar of Wakefield* as 'the philanthropic bookseller of St Paul's Churchyard.' Ralph Griffiths is notable as the founder of the *Monthly Review* in 1749, and Dodsley of the *Annual Register* (1758). Joseph Cottle (1770-1853), the Bristol bookseller, was the friend and early patron of Coleridge, Southey, and Wordsworth. The names of Hutton, Cadell, Strahan, Baldwin, Rivington, Longman, Dilly, Lackington, were no less notable in their day than, in later times, those of Knight, of Edward Moxon, the friend of Lamb and publisher of the early works of Browning and Tennyson, and of John Murray.

In Scotland, after struggling through an age of restriction, the book-trade was developed about the middle of the 18th century. In Edinburgh it engaged Allan Ramsay, who published and sold his songs and his charming pastoral. Among his successors were Donaldson, Bell, Miller, Elliot, and Creech (author; publisher of the first Edinburgh edition of Burns), each eminent in his way; but it was mainly Archibald Constable (q.v.), the first publisher of the *Edinburgh Review* and *Waverley Novels*, and later William Blackwood (q.v.), the originator of *Blackwood's Magazine*, who raised the reputation of Edinburgh as a literary mart in the early part of the 19th century. That reputation has been maintained by W. and R. Chambers; by Adam and Charles Black (see BLACK, ADAM); first publishers of the *Encyclopædia Britannica*, whose house removed to London in 1892; by T. Nelson and Sons, well known for their educational and juvenile publications, series of novels, and reprints of standard works; by Oliver and Boyd; and by Bartholomew and Son, geographical publishers. The preparation of school-books has largely occupied the energies of the two principal publishing firms, while it is worthy of note that two of the most successful encyclopædias, the *Britannica* and the present work, emanated from Edinburgh. Glasgow, where the famous Foulis press had been at work in the 18th century, has during recent years become energetic in publishing, and many books, in educational and general literature, have been issued from local presses by Blackie, MacLehose, Collins, and others.

The purchase of books in the 15th and 16th centuries was confined to the nobler and richer citizens and scholars. In the 17th and 18th centuries the demand for books began to spread among the middle classes. The plan of issuing neat cheap editions of popular works was initiated (1760-70) by Alexander Donaldson, an Edinburgh bookseller (see DONALDSON, JAMES), and by John Bell, who in 1777 issued *British Poets, from Chaucer to Churchill*, which led to the famous meeting of forty members of the London book-trade in the Chapter Coffee-house, and to the publication of Johnson's *Lives of the Poets*. These were followed up by several publishers in London, one of whom, C. Cooke (1790-1800), issued an extensive series of cheap reprints, of a pocket size, called *Cooke's Editions*, commendable for tastefulness of preparation. In the early years of last century Suttaby's, Sharpe's, Walker's, and Dove's pocket editions were stock articles in the trade. About 1817-18 some enterprising booksellers began to break through certain old usages,

by issuing reprints of standard works, in a good style of typography, at considerably reduced prices. At the same time, numerous cheap periodicals made their appearance; but these, for the most part, were of so seditious, irreligious, and libellous a character that the law interposed by the Act of 1819. During the next ten years the only periodical that attained to permanent success was Limbird's *Mirror* (1822), an illustrated weekly sheet (see NEWSPAPER, PERIODICALS). In 1827 the Society for Diffusing Useful Knowledge began to issue its low-priced scientific treatises; and Archibald Constable commenced the cheap series of works in original literature called *Constable's Miscellany*. 'Though Constable in his grand style,' says Knight, 'talked of millions of buyers, he charged his little volumes 3s. 6d. each. He was right. The millions were not ready to buy such books at a shilling, nor even at sixpence. They are not ready now' (1854). All this changed, and as good value could afterwards be had for sixpence and a shilling.

Viewing all previous enterprises of this kind as fitful and insufficient, as well as unsupported by any breadth of appreciation, we have to refer to this period (1827-32) for the true origin of what is now designated the 'cheap press.' Taking advantage of the growing demand for cheap literature, and desirous of guiding it in a right direction, William and Robert Chambers (q.v.) of Edinburgh began, on the 4th of February 1832, to issue *Chambers's Edinburgh Journal*, a weekly sheet at 1½d.: on the 31st of March following appeared in London the *Penny Magazine* of the Society for the Diffusion of Useful Knowledge; and this was followed, July 7, by the *Saturday Magazine*, which was issued under the direction of a committee of the Society for Promoting Christian Knowledge. The success of *Chambers's Journal* led to the issue of *Information for the People*, *Cyclopædia of English Literature*, *Miscellany of Tracts*, and many educational and other works. Charles Knight (q.v.), first editor of the *Penny Magazine*, with his *Penny Encyclopædia*, and *Library of Entertaining Knowledge*, and other works, was another pioneer of the cheap press. Within twenty years he expended £80,000 upon copyrights and literary labour, and during the same period £50,000 upon paper-duty. The effect of the repeal of the advertisement-duty (1853) and of the paper-duty (1861) was to encourage the production of cheap literature. John Cassell's (q.v.) name survives in the firm he founded, along with his *Popular Educator*, *Family Bible*, and innumerable other works; Routledge's *Railway Library* and *Popular Library* of cheap novels, and shilling and sixpenny editions of standard works, were among the first-fruits of the ample crop of cheap editions. Bohn's Libraries are familiar to scholars and lovers of good literature all the world over. The Longmans, honourably connected with the London book-trade for more than a century and a half; Strahan, originator of *Good Words* (1860) and the *Contemporary Review* (1866); Smith, Elder, and Co., proprietors of the *Cornhill* (1860), and publishers of Thackeray and Browning, and of the *Dictionary of National Biography*; Macmillan and Co., publishers of Lord Tennyson's works, and those of men eminent in all departments of science and literature; Murray, J. M. Dent, Jack, T. Fisher Unwin, E. Arnold, John Lane, Hutchinson, Frowde, Hodder and Stoughton, Methuen, Heinemann, along with many others, all added their quota to the rapidly increasing volume of literature.

We have had the works of Shakespeare at sixpence and one shilling, and penny reprints of some classics. Well-printed threepenny editions of standard books, and portions of books, began to

be issued in 1886. For many years previously the *Bibliothèque Nationale* in France, and the *Universal-bibliothek* in Germany, had supplied the public on the Continent with standard literature at similar prices. There is now less reason for Ruskin's reproof that 'we call ourselves a rich nation, and we are filthy and foolish enough to thumb each other's books out of circulating libraries. . . . How much do you think we spend altogether on our libraries, public and private, as compared with what we spend on our horses?' The trade in light literature, and in cheap periodicals and newspapers, has been fostered by the railway bookstalls of Messrs W. H. Smith and Son, Wyman, and Willing in London, Eason in Dublin, and Menzies in Scotland. One reason for the cheapness of good books is the expiry of copyrights; in the case of such popular authors as Scott, Dickens, Thackeray, and Carlyle, it has led to the appearance of many competing editions, some of them very low in price.

The same generation, which witnessed a great reduction in the cost of books, has also had the privilege of purchasing the most luxurious and artistic *éditions de luxe*, frequently printed from type specially cast for the purpose, the illustrations in the highest style of art, and printed on china-paper. Shakespeare, Thackeray, Dickens, and isolated volumes, such as George Eliot's *Romola* and Blackmore's *Lorna Doone*, have been treated in this magnificent manner. To get up a book in this way necessitates the expenditure of many thousands of pounds. The trade in the manufacture of children's picture-books has assumed great dimensions. The best talent in literary and artistic circles has been employed in the production of books for the young. The bright and attractive books and periodicals for juveniles are often the envy of older minds. There are fashions in books, and the sale and use of Birthday Books (q.v.) led to an enormous business being done. The great improvements in Book-binding (q.v.), and abundance of illustrations in Christmas books, or books for presents, have given a stimulus to certain branches of the trade. The great bookselling season is from October to February, when the nights are long; during the summer, fiction and the lighter periodicals sell best. For the last three months of the year the wholesale booksellers have a hard time of it, executing orders for the various annual volumes of the periodicals, and Christmas literature of every kind. The practice which Dickens inaugurated of issuing Christmas numbers has grown enormously, and has been adopted with profit by many leading illustrated newspapers and periodicals. Good newspaper notices sometimes start the sale of a book; when it has begun to sell, if really good, its success proves its best advertisement. When a book has been issued at one guinea, or two guineas, after the richer public has been exhausted, a moderately cheap edition may be brought out at a price from 5s. to 10s. 6d., followed up at a proper interval, if the book is calculated for wide circulation, by an edition at 2s. 6d., or less.

The position of those who, in the hurry of business life, and in the time occupied in earning a living, have little leisure for solid reading has been abundantly catered for in the 'story' paper, and the lighter periodicals. Convenient abridgments, manuals, compendiums, and primers of almost every branch of knowledge exist; while many publishers have made quite a feature of 'condensed' lives of celebrities. See BIOGRAPHY.

The circulation of our weekly and monthly periodical literature is enormous, and can be calculated only by millions of copies.

As circulating libraries, by creating a taste for reading, led to the establishment of the cheap press, so, as might be expected, has the cheap press extended the sphere of literature, and given rise to public libraries and book-clubs. C. E. Mudie in 1842 introduced a new system of subscription lending library, and since then the firm have purchased many millions of volumes for the use of subscribers; so that in many cases what would formerly have been considered to be large editions are absorbed by one purchaser. After being used for several months, the surplus copies are sold at a cheap rate. The London Library is also well known. Messrs Smith's remarkable system of bookstall libraries was begun in 1858.

The selling of second-hand books from open stalls, and from Booths (q.v.), is a practice so ancient as to be connected with the trade of the stationarii of the middle ages. Some men of no little note in the book-trade began in the humble quality of stall-keepers. London is the chief seat of the second-hand book-trade; but it is also conducted on a considerable scale in Edinburgh, Glasgow, Manchester, Liverpool, Oxford, Cambridge, Dublin, Bristol, and other centres of wealth and intelligence. In many cases what are called 'remainders' of an edition are purchased and sold at a merely nominal price by the second-hand booksellers. But the dealers procure supplies chiefly at public auctions of the libraries of deceased clergymen, professors, and private gentlemen, of which sales there is a constant succession in London, Edinburgh, and elsewhere. At these auctions good editions of standard books may usually be obtained at moderate prices; but rare and curious works, prized by the 'bibliomaniac,' frequently bring very high sums. See BIBLIOMANIA. Dealers in second-hand books send catalogues to their customers throughout the country, and from this source not a few private libraries are mainly made up. Large quantities of second-hand high-class works are purchased for public libraries forming in the United States. From France, Italy, and Germany there has been a similar export-trade in fine old editions to North America.

The *Canvassing-trade* consists in the disposing of books mostly in weekly and monthly numbers or parts by a system of house-to-house visitation. Smollett's *History of England*, Stackhouse's *History of the Bible*, and Scott's *Bible* are early examples of successful publication in number form. Amongst modern authors, Thackeray, Dickens, and George Eliot tried the part form of publication with success. There are also various societies in this country employing book-hawkers or colporteurs, who visit outlying districts which are not reached by the ordinary bookseller.

Apart from the general trade, the publication of small books, tracts, and periodicals is carried on to a large extent also by associations for religious purposes, the funds for which are raised by voluntary subscription. See the article TRACT SOCIETY.

Another distinct kind of trade is that of printing and publishing authorised versions of the Bible, New Testament, and Book of Common Prayer. The preparation of these works has always been a prerogative of the crown, which grants exclusive privileges or patent rights to certain parties for the purpose. According to old usage, England, Ireland, and Scotland are treated separately. The last patent for England was granted by George IV. to Andrew Strahan, George Eyre, and Andrew Spottiswoode, for a term of thirty years; and having commenced on the 21st of January 1830, it expired on the 21st January 1860, and was then renewed during pleasure. The universities of Oxford and Cambridge have, by royal charters, enjoyed the

right of printing Bibles, &c., in common with the patentees; but as the King's printers represent the owners of the copyright, the privilege of prosecution for infringement belongs to them alone. In the case of the revised version of the Bible, issued in 1881 and 1885, the university authorities purchased the copyright from the revisers, and consequently have the sole right of publication; over one million copies of the New Testament were sold (by the Oxford University Press alone) on the first day of its appearance. See PATENT.

In Ireland, George III. in 1766 granted a Bible patent to Boulton Grierson for forty years. He was succeeded by his son, George Grierson, who in 1811 obtained a renewal. Trinity College, Dublin, had also a concurrent right. In Scotland the last patent expired in 1839, and was not renewed. The crown appoints a Board with authority to grant licences to parties desirous of printing editions of the Bible and other books falling within the royal prerogative, such as the Confession of Faith.

The modification of the patent having tended to lower prices, the possibility of any further material reduction seems doubtful. One noticeable feature of the trade in Bibles is that the publishers in England sell large numbers in sheets to the various religious societies, such as the British and Foreign Bible Society and the Society for Promoting Christian Knowledge, who issue editions to the public under cost price. From their cheapness, but more particularly from their accuracy, English-printed Bibles and New Testaments are purchased in large quantities by the United States. The Oxford University Press now carries on the whole process of Bible production within its own premises.

Although the printing of the authorised version of the Bible, the New Testament, and the Book of Common Prayer seems to be reserved to the nominees of the crown, practically no objection is taken to the printing of these works by others. Translations of the Bible, other than the authorised version, are also issued freely by Roman Catholic and other bodies.

The universities of Oxford and Cambridge, the four Scottish universities, and the colleges of Eton, Westminster, and Winchester obtained an act of parliament, 15 Geo. III. chap. 53, giving them a perpetual copyright of all works belonging to them, or which might afterwards be bequeathed to or given to them, provided such works are printed at the university or college presses. The only works in existence older than last century, claimed by any of the above institutions, to which any value can be attached, are Clarendon's *Life*, and his *History of the Rebellion*, with its continuation. The right to this and other works possessed by the university of Oxford was confirmed by the Copyright Act (5 and 6 Vict. chap. 45). The profits of the first edition were applied towards the erection of the 'Clarendon Building' (1713).

The British book-trade is centred in London, though carried on to a considerable extent in Edinburgh, and to a less degree in Oxford, Cambridge, Liverpool, Manchester, Dublin, Glasgow, and a few other places. The London book-trade is partly carried on in distinct departments: miscellaneous literature, law books, medical books, educational treatises, periodicals, &c. respectively engage the attention of publishers; and as regards religious books, each sect may be said to have publishers and booksellers of its own. Some houses, notably Charles Griffin and Co. (under Mr F. J. Blight) have specialised in technical books. The larger number of the publishing and commission houses are situated in Paternoster Row and the streets adjoining; so that this part of the city has become the great and acknowledged market for literature. Covent Garden and Fleet Street are

likewise centres of the business. Between the country booksellers and the leading publishers and commission-houses a continual correspondence is kept up. In addition to his daily or weekly parcel every provincial bookseller makes up a monthly order for magazines, periodicals, and books.

In the infancy of the trade, authors frequently resorted to the plan of getting friends and patrons to subscribe for copies of their forthcoming works, the publisher in such cases acting only as commission-agent. Literature has now risen above this degrading system. At present (1) the author sells his work in manuscript to the publisher for a specified sum, giving him an assignment of the copyright, and leaving him to bring out the work according to his own taste; or (2) the author retains the copyright, pays all expenses, undertakes all risks, and gets a publisher to bring out his work; or (3) the author, retaining the copyright, incurs no risk, and only allows the publisher to print and issue an edition of a certain number of copies for a sum agreed on; or (4) the author and publisher issue the work at their joint risk, in that case sharing equally in profit or loss, or on such other terms as are mutually agreeable; or (5) the publisher agrees to issue the works of a popular author at his own risk and expense; the clear profits are divided into three equal shares, one of which is paid to the author, and two retained by the publisher, or the author may receive half-profits, which in the case of a 5s. book may amount to 9d. or 1s. a copy; or (6) by the familiar 'royalty' system the publisher takes whole or partial risk and pays the author a certain sum per copy, after the disposal of a specified number of copies. Under the French system the publisher takes the book, and makes what he can of it, but pays the author a royalty. Under the French law the printer is forbidden to print copies except by order of the author.

Publishing is an exceedingly hazardous profession, and those engaged in it must possess wide and special knowledge, else they may soon lock up their capital unprofitably, and fill their warehouses with waste-paper. This is especially the case in dealing with literature which is sold at a very small advance upon the actual cost of paper, print, and binding. Attached to the larger publishing houses are men who read and give judgment on the manuscripts submitted to their care, when this is not undertaken by the head of the firm. Works of which the highest expectations are formed may not pay expenses; and books of a seemingly worthless kind may prove exceedingly remunerative. Ruskin objected on principle to the booksellers' system of discounts and abatements: after 1873 he severed his connection with his former publishers, and appointed an agent of his own, who issued new editions of most of his writings. This led to the rise of the firm of George Allen and Sons. Ruskin, however, had to relax this rule of selling at a fixed price, and allow the booksellers a discount of 10 per cent. An 'Incorporated Society of Authors' was founded to watch over the interests of authors, and to support the Copyright Association (composed of publishers and authors) in furthering the establishment of the International Copyright Union.

Milton's agreement with Simmons the printer, disposing of the copyright of *Paradise Lost* for five pounds, is an oft-quoted but inadmissible argument against publishers, as a larger sum was paid, and at that time it might even have been a losing bargain. It would be easy to cite many publishers' blunders, in at first refusing works which, when issued, have taken their place amongst the classics of literature. Publishers as a rule are high-minded, fair, though keen men of business, and it is quite

to their advantage to treat an author well. There have been cases of gross injustice, but when an author's books find a ready market he reaps a ready benefit. If we take fiction, we find many instances of large sales and large earnings. Scott's income from his pen ranged from £10,000 to £15,000 per annum for many years. He is said to have received £110,000 for 11 novels and 9 volumes of tales. *Woodstock* alone yielded him £8228, and his *Life of Bonaparte* (2 editions) £18,000. Thackeray, when he became famous, was well paid for every line he wrote, and received a handsome salary for editing the *Cornhill*. For several novels Trollope and Dickens each received more than £3000, while the bargain for *Edwin Drood* was £7500 with a share in after profits. Routledge paid Lord Lytton £20,000 for the right to publish a cheap edition of his novels for ten years. George Eliot was paid £40,000 cash down for the first sales of her various books; for *Felix Holt* she was paid £5000, *Romola* £7000, and *Middlemarch* £8000. Macaulay received a cheque for £20,000, being his share of the profits of two volumes of his *History*. Browning received 100 guineas for his ballad 'Hervé Riel' in the *Cornhill*. These may be thought exceptional payments, but the rule holds good that where an author finds a large public, he secures a willing publisher and large payments.

In publishing new books, the copyright, setting up the types, author's corrections, stereotyping, press-work or printing, paper, binding, advertising, and presentation copies to editors for review, all need to be taken into account. When the author retains the copyright, the publisher charges, besides the above items for printing, &c., a commission on the sales of the work. Editions of a book are frequently wanted for an export order, or sets of stereotype plates are purchased by publishers in the United States or Canada, in order to print from. New books are issued at a certain selling price to the public, and the publisher allows a percentage off the price to the retail bookseller. In a large proportion of cases there is interposed the commission-agent or wholesale dealer. A new book on the eve of publication is offered to the trade at a slightly cheaper rate than at a later date. At the trade sales, which are now less common than formerly, some publishers do a large business.

Throughout the more respectable part of the trade there is a constant effort to maintain unbroken prices; for when a book can be obtained by booksellers below trade-price, it is essentially ruined for all regular business. On the other hand, the practice has become very general among retail booksellers of selling new books to the public at prices little above cost. This system of underselling has caused much disquietude in the trade. Mr Sampson Low was secretary of a trade association (abolished 1852) which had for its object the protection of the bookseller against underselling. For a long time resolute attempts were made by the heads of the profession to refuse to deal with undersellers; but these, appealing to the public, ultimately conquered; and now books of all kinds are disposed of at such prices as the bookseller pleases, unless in the case of those published at a net price. The development of the net system has helped to preserve the bookseller from extinction, as the usual discount given on new books left him a very bare living. After making all ordinary deductions, to which losses, &c., may be added, publishers can reckon on receiving little more than half the price at which their books are nominally issued. Many publishers annually spend very large sums in advertising new books.

Publishers are under the legal obligation to

deliver, free, a copy of every book they issue (new editions without alterations excepted) to the following public institutions: Library of the British Museum; Bodleian Library, Oxford; University Library, Cambridge; Trinity College Library, Dublin; National Library of Wales, Aberystwyth; and the Library of the Faculty of Advocates, Edinburgh. Lord James and Sir Richard Webster gave in 1887 a decided opinion that copies of every American book issued in Great Britain, though printed and originally published in America, must also be sent to the British Museum. Manufactured American books are imported in large quantities by British publishers, who, for the convenience of purchasers, print on the title-page the name of the firm which has introduced the work into Great Britain; hence the claim of copies by the British Museum. There is no compulsion as to registration of titles at Stationers' Hall, the fee for which is 5s. (see COPYRIGHT). The title of a popular book or periodical is often of great value, and is jealously guarded by the publisher; the use of this title by another is an infringement of copyright. Owing to the rapid multiplication of books, it is becoming increasingly difficult to steer clear of titles already in use. The works acquired by the British Museum under the Copyright Act are more numerous than those purchased or presented. See BRITISH MUSEUM.

The gradual development of the book-trade may be studied in the catalogues. One of the first catalogues compiled in England (1666-80) has a list of 3550 works, showing a yearly average of 253. From 1700 to 1756, without including pamphlets, 5280 new books were issued. The *Modern Catalogue of Books* (1792-1802) has a list of 4096 new works, or an annual average of 372 new books. In the *London Catalogue* of 1800-27 the publications, including reprints, amounted to 19,860 volumes; that of 1816-51 contains the titles of 45,072 books, an average annual publication of more than 1200 books. There were three times as many books published in 1853 as there had been in 1828. The annual production of new books in the period 1877-87 averaged 4000 volumes; of new editions, 1400. The number of new books issued during 1913 was 9541; the new editions, 2838; for 1919, 7327 and 1295; and for 1921, 8757 and 2266. But there is no compulsory registration, and the only statistics available are based on the compilation of *The English Catalogue*. In the United States 7625 new books and 969 new editions appeared in 1919, 7336 new books (including 2235 pamphlets) and 1086 new editions in 1920. Of these last 6831 were by American authors, 615 by foreign authors but of American manufacture, and 976 imported. At the beginning of the 20th century the remarkable cheapening of paper, the use of labour-saving machinery, the cheapening of illustrations, and the use of coloured illustrations were striking features in book production. Cheapness, it seemed, could scarce go further than in *Everyman's Library* and kindred series. Another feature was the luxuriant crop of novels, not in the old three-volume form, which practically ceased after 1897, but in one volume at 6s., as the standard size and price, with plentiful issues and reissues at 2s., 1s., 7d., and 6d. These are sold in millions, and appeal to the whole civilised world. Prices, of course, rose during and after the Great War. Advertisements of highly priced books on the instalment system have diverted much business from the usual trade channels, as did also the founding of the *Times Book Club* (1905). The literary agent also changed the direct method of dealing with publishers, more to the advantage sometimes of the author of reputation. The Authors' Society exists for the protection of the rights of the author; the booksellers have their associations also; while the

Publishers' Association of Great Britain and Ireland stands for the producers of literature.

In Germany, where the book-trade first became established, the principal mart was Frankfort, to whose fairs the early booksellers and printers resorted. Leipzig also became a great mart for books as early as 1680; but in 1885 as many books were published in Berlin as in Leipzig; and since about 1830 Stuttgart also has come to the front, whilst Frankfort has entirely lost its ancient prestige. From the teeming press of Bernhard Tauchnitz of Leipzig there have been issued, by arrangement with British and American authors and publishers, thousands of volumes of cheap reprints of English popular works in a pocket size. The bringing of these German reprints of English copyright works into Great Britain is against the law, and copies are liable to seizure. Book-buyers in Germany have the privilege of receiving books on approbation from the booksellers and publishers: in this way an examination can be made of the proposed purchase, which may be returned.

Though Germany has the largest number of new books of any country in Europe, editions are relatively small; and the encouragement to men of letters is poor. Great use is made of the circulating library, upon which the publisher mainly depends for the sale of a popular work. Some of the illustrated papers have an enormous circulation.

In France every book and pamphlet must be registered before publication, and publishing is carried on chiefly in Paris, where there are many extensive printing establishments. About two-thirds of all the books published issue from Paris. A large number of the scientific works are published at the sole cost of the state. French books are, with few exceptions, done up simply in coloured paper covers, for temporary service; works of a superior class are executed with a high degree of taste—the excellence of pictorial embellishments being always conspicuous. The finest *éditions de luxe* used to be French; and many expensive works in French, and also in the classical languages, issued from the Parisian press still command a large sale. Owing to the almost universal knowledge of the French tongue, there is a large export to foreign countries.

Belgium possesses a flourishing book-trade; and Brussels, as a kind of minor Paris, is the seat of some extensive printing and publishing concerns. In Italy there has been a revival in book-publishing and bookselling. The trade of the other European countries is of less interest.

The book-trade of the United States sprang up from small beginnings within the 19th century. Hezekiah Usher was in business in Boston in 1652; bookselling was well established at the beginning of the 18th century. Benjamin Franklin (q.v.) was one of the most famous of the early printers. But at first scholars and libraries were mainly supplied with books from Europe, and the bulk of American publications were reprints of British literature. A few of the larger publishing houses, such as Harper's in New York, and Lippincott's in Philadelphia, print, bind, and manufacture the books they sell. The Harpers were the original American publishers of Scott, Dickens, Bulwer, George Eliot, Thackeray, Trollope, and Meredith; see *The House of Harper, 1817-1912*, by J. H. Harper (1912). The names of Appleton, Roberts Brothers, Ticknor and Co., Houghton, Mifflin and Co., Scribner, and others are well known. A very large proportion of the book business is done by book-agents or canvassers. At the fall and spring trade sales a large business is done, both in new publications and in older standard works, at a discount of from 25 to 40 per cent. off the usual trade prices. Local booksellers have suffered through the commission-agents

and library associations who deal directly with publishers.

A common arrangement between the American author and publisher is a payment of 10 per cent. royalty on the retail price of all sales; sometimes a lump sum is paid, and the publisher secures the copyright, which is granted for twenty-eight years, subject to renewal by the author, his widow, or children, or failing these his executors, or if there be no will his next of kin, for other twenty-eight years. A condition is that a copy of a title-page must be registered with the librarian of congress, and two copies of the best edition of the book lodged there within ten days of publication. A copy of any new edition must also be sent to the librarian.

American books are now executed with great neatness and taste; their wood-engravings, notably those in *Harper's*, *The Century*, and *Scribner's Magazine*, have been brought to a pitch of remarkable beauty both in design and in printing, largely by help of improvements in process engraving. All these magazines have gained a firm footing in Great Britain. The *Atlantic Monthly* and the *North American Review* have had as contributors and conductors some of the most eminent literary men that America has produced. Several English publishers have found it to their interest to have branch establishments in New York, while several American publishers have also branches in London. The methods of American book distribution differ from those in Britain in that general stores largely take the place of the bookseller. The net system was partially adopted in 1901.

The 'libraries,' collections of cheap reprints of British copyright books, extended some of them to more than 500 volumes. Of a former edition of the present Encyclopædia there are several unauthorised reprints. There was a reprint of all Ruskin's works at a much lower figure than one of his earlier books once cost in England; while his *Sesame and Lilies*, *Crown of Wild Olive*, and *Ethics of the Dust* appeared in one volume for about 2s., or about one-eighth of what Ruskin charged for them in England. Froude's *Carlyle* and George Eliot's *Life* could be had for fewer pence than they at first cost shillings in England. When the average published price of Black's or Blackmore's novels in England was 6s. a volume, they could be bought in New York at 10 or 20 cents. But since the granting of copyright to works set up and printed in the United States (1891) arrangements between Britain and America have been on a more satisfactory footing. Unauthorised reprints imported into the United Kingdom were liable to seizure by the custom-house officers. On the other hand, American books have often been reprinted in England without anything being paid to the author. See COPYRIGHT.

The modern bookseller and publisher has many trade helps, the best of which are the following: *The London Catalogue*, giving a list of 42,340 works published between 1831 and 1855; the *British Catalogue*; the handy and useful *English Catalogue of Books* (published annually); Whitaker's *Reference Catalogue of Current Literature* (first issued in 1874), which is a volume of publishers' catalogues in alphabetical order, modelled on the late F. Leypoldt's *American Trade List Annual*; Roorbach's *Bibliotheca Americana*, a catalogue of books issued from 1820, continued by Kelly, in supplements, to 1871; and the *American Catalogue* of authors and titles. Sonnenschein's *Best Books* (1887; 2d ed. 1891) can be recommended. The recognised trade journals are in this country the *Bookseller* (monthly) and *Publishers' Circular* (weekly), in the United States the *Publishers' Weekly* and *American Bookseller*, all of which issue Christmas numbers containing announcements and criticisms of books, with specimens of the illus-

trations. In Germany the *Börsenblatt* is the organ of the trade, and there is a copious German encyclopædia of the book-trade, edited by Ebner and Weisbach (1887).

See the 'Bibliography of Bookselling and Publishing,' by W. H. Peet, published in *N. and Q.*, 1904; Frank A. Mumby, *The Romance of Bookselling* (1910); Knight, *Old Printer and the Modern Press* (1854) and *Shadows of the Old Booksellers* (1865); Curwen, *History of Booksellers* (1873); Kapp and Goldfriedrich, *Geschichte des deutschen Buchhandels* (1886 et seq.); Welsh, *Bookseller of the Last Century: John Newbery* (1885); *Bibliographical Catalogue of Macmillan & Co.'s Publications, 1843-89* (1889); Roberts, *Earlier History of English Bookselling* (1889); Arber, *List of Eight Hundred and Thirty-nine London Publishers between 1553 and 1640* (1890); Putnam, *Authors and their Public in Ancient Times* (1893); A. Growell, *The Profession of Bookselling* (for the American trade; 1893-1913); Edward Marston, *Sketches of Booksellers of Other Days* (1901), and *Sketches of Some Booksellers of the Time of Dr Samuel Johnson* (1902); the lives of Dodsley, Lackington, Hutton, William and Robert Chambers, Constable, D. Macmillan, Alexander Macmillan, Adam Black, John Murray I., John Murray III., Hatchard, William Nelson, W. H. Smith, Pitman, John Cassell, Blackie, Tinsley, Edward Marston; articles on many of these in the present work; memoirs of booksellers and publishers in *Dictionary of National Biography*; *Annals of a Publishing House* (Blackwood's), by Mrs Oliphant and Mrs Porter (1897-98); Messrs Griffin's Centenary Volume (ed. F. J. Blight, 1921); and the articles BIBLIOGRAPHY, BOOK, BOOKBINDING, BOOK-CLUB, COPYRIGHT, ILLUSTRATION, LIBRARY, NEWSPAPER, PAPER, PERIODICALS, PRESS, PRINTING, STATIONERS' HALL, STEREOGRAPHY, TYPES, TYPE-SETTING MACHINES, WOOD-ENGRAVING.

Bookworm, any grub which feeds on the paper of books. The name more especially belongs to the larva of an anobium (*Anobium pertinax*, *A. eruditum*, &c.), a small coleopterous insect, which is one of the Death-watch (q.v.) insects; though the larva of *Ceophora pseudospictella*, a small brown moth, seems to have nearly an equal claim to it. The latter much resembles the anobium, save that it has six legs, while the anobium has none. Most people are familiar with the effects of the bookworm's ravages; but the creatures are extremely rare in this country, especially since so many chemical substances have been introduced into the manufacture of paper. In Southern Europe, the book-eating anobium is still common enough. It is not unlike the little grub found in hazel nuts—has a soft body with a horny brown head and strong jaws, and readily succumbs to exposure. As it usually attacks from the boards inwards, the interior pages of a book are generally safe from its ravages; though M. Peignot asserts he found twenty-seven volumes standing in a row, pierced from end to end by a single worm-tunnel, and Mr Blades has known this happen with at least two volumes. In America, books in libraries, though free from the ravages of the bookworm, are infested and damaged by a small cockroach—the Croton Bug, or *Blatta Germanica*. Probably several kinds of caterpillars of moths, and grubs of beetles, injure books more or less. See BORERS, BOOK-LICE; Blades, *Enemies of Books* (new ed. 1888); *N. and Q.*, May 1885; *Booklore* (1886); *Antiquary*, vol. x.; Butler, *Our Household Insects* (1893); O'Connor, *Facts about Bookworms* (1898).

Boole, GEORGE, a distinguished mathematician and logician, was born at Lincoln, 2d November 1815, and received his education mainly from his father, an intelligent tradesman. He successfully started a school at Lincoln in 1835; devoted his spare time to study, and in 1849 became professor of Mathematics in Queen's College, Cork, a post he held till his death, 8th December 1864. He had long been one of the foremost mathematical

thinkers of his time. Among his publications are *Analytical Transformations* (1839), *General Method in Analysis* (1844), *Mathematical Analysis of Logic* (1847), and papers on Probability. His fame as a logician chiefly rests upon his *Laws of Thought* (1854), a work of great originality and power, in which classes of objects and ideas, denoted by mathematical symbols, are dealt with by the ordinary rules of algebra, so that logical results are obtained by mathematical processes.

Boom, a town of Belgium, 10 miles S. of Antwerp, with great brick and tile works, breweries, tanneries, rope-walks, sailcloth manufactures, salt-works, and shipbuilding yards; pop. 20,000.

Boom, in a ship, is a general name for the long spars which jut out from certain supports or uprights, to stretch or extend the bottom edge of sails. According to their connections, they receive the names of jib-boom, flying jib-boom, main boom, square-sail boom, &c. In the old 110-gun ships of Nelson's days, these booms varied from 57 to 32 feet in length. Modern ironclads are provided with a number of booms to be fitted at intervals along their sides, from which may be suspended a huge net encircling the ship at a sufficient distance from the side to render an explosion from an enemy's torpedo harmless. The term boom is also applied to a strong iron chain, or a combination of spars, &c., lashed together with chains and cables, and employed in barring the navigable passage of the mouth of a harbour or river. The wooden boom across the harbour was an important feature in the famous defence of Londonderry in 1689. The Russians barred the entrance to the harbour of Sebastopol by a barrier of sunk ships and booms. When Farragut's fleet attacked New Orleans in 1862, it had to destroy formidable chains across the river buoyed on hulks. And see DUNDONALD.

Boomerang, a wooden missile used by the aborigines of Australia in hunting and in war, is found also in the New Hebrides and elsewhere. It is made of the green wood of the acacia or other hard tree treated by fire, is curved, and is from 2 feet to 2 feet 9 inches long by from 2 to 3 inches broad. It has one side convex, the other flat, with a sharp edge along the convexity of the curve. The curve varies greatly in different instruments.



Various Forms of Boomerang.

When to be thrown, it is taken in the hand by the handle (which has cross cuts on it), and held up at arm's length over the shoulder. With the convex edge forward and the flat side down, it is then thrown directly onward with a strong quick fling, as if to hit some one 40 yards in advance. The hand is drawn back at the same time, with a movement like that in the 'screw-back' stroke at billiards. The missile slowly ascends in the air,

whirling round and round, and describing a curved line of progress till it reaches a considerable height, when it begins to retrograde, and finally, if thrown with sufficient force, falls 8 or 10 yards behind the thrower, or it may fall near him. This surprising motion is produced by the bulged side of the missile. The air impinging thereon, lifts the instrument in the air, exactly as by hitting the oblique bars in a windmill, it forces it to go round. It should be added that the path of the boomerang can be varied by the will of the thrower, and that the sweep of no two boomerangs exactly agrees. The force with which it flies is great; the Rev. J. G. Wood saw a dog killed on the spot, and nearly cut in two by the stroke. The ingenuity of the contrivance, and the skill with which it can hit the mark aimed at, are very extraordinary as coming from almost the lowest race of mankind. Attempts have been made to derive it from some hypothetical high culture, but the intermediate forms between it and the war-club or battle-axe have been found in its own country, and there are good grounds for considering it really a native invention developed through such stages to its present form. 'Various missiles,' says Tylor, 'have been claimed as boomerangs: a curved weapon on the Assyrian bas-reliefs, the throwing-cudgel of the Egyptian fowler, the African *lissan* or curved club, the iron *hungamunga* of the Tibbats, but without proof being brought forward that these weapons, or the boomerang-like iron projectiles of the Niam-Niam, have either of the great peculiarities of the boomerang, the sudden swerving from the apparent line of flight, or the returning to the thrower.' The returning boomerang is a toy; the war boomerang does not normally return.

Boondee. See BUNDL.

Boone, DANIEL, a famous American pioneer, was born in the state of Pennsylvania, February 11, 1735. At an early period of his life he emigrated to North Carolina; but his love of the wilderness not being sufficiently gratified there, he planned an expedition into Kentucky, then almost unknown. In June 1769, along with five companions, he halted on the Red River, a branch of the Kentucky. After a few months' hunting, he was captured by the Indians, but soon escaped, and accidentally falling in with his brother, who had pursued his track, lived with him in a cabin during the whole winter. In May 1770 his brother went home, and Boone himself was left alone in the perilous forest. In July his brother returned, and after exploring a considerable portion of country, they returned in 1771 to Carolina, determined to emigrate with their families to Kentucky; but the opposition of the Indians rendered the attempt unsuccessful. Shortly after, Boone was engaged as the agent of a Carolina company in purchasing the land on the south side of the Kentucky River, and here in 1775 he built a stockade-fort on the site now occupied by Boonesborough. In 1777 the place was twice attacked by a swarm of Indians, who, however, were repulsed. In 1778 Boone was once more captured, but once more managed to make his escape and reach the fort in time to repel, with his little garrison of fifty men, another determined Indian attack. On the admission of Kentucky to the Union, Boone lost his property for want of formal titles, and retired in 1798 in disgust into the wilderness of Missouri, which did not become United States territory till 1803. In 1812 his claim to a tract of land was allowed in recognition of his public services. He died in 1820.

See *Lives* by Filson (1784), Peck (1856), Bogart (1854), Abbott (1875), Thwaites (1902), Bruce (1910), Gulliver (1916).

Boone, a city of Iowa, 43 miles NW. of Des Moines, with flour-mills, tile-works, and potteries, and trade in coal, grain, and live-stock; pop. 12,500.

Boonville, (1) a city of Missouri, 100 miles E. of Kansas City, with manufactures of earthenware, bricks, carriages, leather, and tobacco; pop. 5000.—(2) A city in Indiana, 18 miles NE. of Evansville; pop. 4500.

Boorde, or BORDE, ANDREW, facetiously styled by himself 'Andreas Perforatus,' was born about 1490, near Cuckfield in Sussex, and brought up a Carthusian, but about 1528 got a dispensation from his vow and studied medicine, as he tells us, at Orleans, Toulouse, Montpellier, and Wittenberg, travelling moreover as wide as Rome and Compostella. On his return to England, he was patronised by Cromwell, and afterwards travelled in his behalf on a confidential mission through great part of France and Spain. The year 1536 he spent in practising and studying medicine at Glasgow, and tells us that he found the natives flattering and false. He next returned to London, thereafter crossed the seas and travelled by Antwerp, Cologne, Venice, and Rhodes to Jerusalem. After his return, he lived a while in London, then most likely in Winchester, where his flagrant immoralities soon brought him into serious trouble. In the spring of 1549 he found himself in the Fleet prison in London, and soon after he died. Boorde's chief works are his *Dyetary* and the *Fyrst Boke of the Introduction of Knowledge*, edited by Dr Furnival for the Early English Text Society in 1870. His *Itinerary of Europe* has perished, but the *Handbook of Europe* survives, and the *Itinerary of England or Peregrination of Doctor Boorde* was printed by Hearne in 1735. Many books, moreover, have been fathered on the fantastic old reprobate, and some have asserted that he was the original 'Merryandrew.' The earliest known specimen of the Gypsy language occurs in the *Introduction*.

Boos, MARTIN, a Catholic priest, born 25th December 1762 at Huttenried in Bavaria, was from about 1790 the originator of a religious movement closely akin to those of the Protestant Pietists. From 1806, when he settled at Gallneukirchen, his influence spread widely among the Catholic laity, and extended to about sixty of their priests. Himself a staunch Catholic, he was often and bitterly persecuted, till in 1817 the Prussian government appointed him a professor of theology and teacher of religion at Düsseldorf. In 1819 he removed to Sayn, near Neuwied, and died there 29th August 1825.

Boot. See BOOTS AND SHOES.

Boot, also called BOOTS, or BOOTIKIN, an instrument of judicial torture, formerly used in Scotland to force confessions from persons accused of crimes, or answers from unwilling or suspected witnesses. Bishop Burnet in the *History of his Own Time*, and Sir Walter Scott in his *Old Mortality*, speak of the boot as made of iron; but the Rev. Thomas Morer in his *Short Account of Scotland* (1702), written from personal observation of the country at a time when the boot was still in use, describes it as 'made of four pieces of narrow boards nailed together, of a competent length for the leg, not unlike those short cases we use to guard young trees from the rabbits.' One or both legs of the person to be tortured having been placed in this case, wedges were inserted between the limb and the sides of the case, and these wedges were driven down by the executioner with a mallet or hammer, questions being at intervals put to the sufferer, until either he gave the desired information, or fainted away, or showed such endurance as satisfied the judges that no answer

could be extorted from him. In one case—that of a lad in Orkney in 1596—it is recorded that they struck as many as fifty-seven times. In another—that of John Fian, schoolmaster at Prestonpans, burned for sorcery in 1591—the victim ‘did abide so many blows, that his legs were crushed and beaten together as small as might be, and the bones and flesh so bruised that the blood and marrow spouted forth in great abundance, whereby they were made unserviceable for ever.’ ‘Still,’ it is added, ‘he would not confess;’ and, indeed, it is remarkable in how many cases we are told that the torture, agonising as it was, failed in its purpose. When the boots were first used in Scotland is not known. In a case where a deed of conveyance of land was challenged as a forgery in 1579, two witnesses, a clergyman and a notary, both of Forfarshire, were ordered to be ‘put in the boots, gins, or any other torments, to urge them to declare the truth.’ In a letter, preserved in the Record Office at London, Sir Francis Walsingham writes to the English ambassador at Edinburgh in 1583, that Queen Elizabeth desires that Father William Holt, an English Jesuit then in Scotland, may be ‘put to the boots.’ The boot was subject of allusion on the English stage in 1604; in Marston’s *Malcontent*, printed in that year, one of the characters is made to say: ‘All your empirics could never do the like cure upon the gout the rack did in England, or your Scotch boots.’ A servant girl gave evidence under the torture in the Fren-draught case in 1632, and several others were ordered to be put to the torture. It was revived after the insurrection of the west-land Covenanters in 1666, and continued to be used throughout the reigns of Charles II., and James II., and during the first years of William III. The Claim of Right brought forward by the Scottish Convention in 1689, denounced ‘the use of torture, without evidence, and in ordinary crimes, as contrary to law.’ Notwithstanding, Neville Payne, an English gentleman who was supposed to have entered Scotland on a treasonable mission, was in 1690 put to the torture under a warrant subscribed by King William, and still shown in the Register House at Edinburgh. The boot was applied to one leg, the thumb-screws to both hands, but without any effect, although, in the words of one of the Privy-councillors, the torture, which lasted for two hours, was inflicted ‘with all the severity that was consistent with humanity, even unto that pitch that we could not preserve life and have gone further.’ This is believed to be the last time that the boot was used. But it was not until 1709, when Scotland had ceased to be an independent kingdom, that the British parliament enacted that in future ‘no person accused of any crime in Scotland shall be subject or liable to any torture.’ Torture is believed not to have been used in England after 1640. An instrument similar to that known in Scotland was in use in Germany under the name of ‘Spanish Boots.’ And in some collections there are shown iron boots which were heated to an unbearable degree on the foot of the victim (see TORTURE). For the boot in France, see *Fountain-hall’s Diary* (1900), and Bingham’s *Bastille* (1888).

Bootan. See BHUTAN.

Boötes, in Greek Mythology, the son of Demeter and Iasion, who, being plundered of all his possessions by his brother, invented the plough, and cultivated the soil. He was translated to heaven with the plough and yoke of oxen, under the name of Boötes (‘ox-driver’), which is still borne by a constellation beside the Great Bear (or

Wain). According to others, Boötes was the son of Lycaon and Callisto (see URSA MAJOR). The bright star *Arcturus* is in Boötes.

Booth (from a Scandinavian word, seen in Danish *bod*, Icelandic *búa*, ‘to dwell,’ and perhaps in German *bude*), a covered stall or hut at a market or fair, from which goods are sold, still much used in the east of Europe and in Asia, and in England at Weyhill Fair, near Andover. As towns sprang up, the yearly fair was more or less supplanted by the weekly market. The slight booth which was set up in the same spot every week, had an irresistible tendency to become substantial and permanent; and the records of the twelfth and some following centuries are full of unavailing complaints against the encroachments which were in this way made upon the market-places and streets. Thus, Joceline of Brakelond chronicles the ineffectual efforts of his great and wealthy abbey, in 1192, to dislodge the burgesses of Bury St Edmunds from the shops, sheds, and stalls which they had erected on the market-place without leave of the monks. Stow relates that the houses in Old Fish Street, in London, ‘were at the first but movable boards set out on market-days to show their fish there to be sold; but procuring license to set up sheds, they grew to shops, and by little and little, to tall houses.’ The same chronicler tells us that ‘in Cheapside, from the great conduit west, were many fair and large houses, which houses in former times were but sheds or shops, with solars (i.e. lofts or upper chambers) over them.’ So in Edinburgh the range called at first ‘the Boothdraw,’ and afterwards ‘the Lucken-booths,’ arose in the very centre of the High Street. The trader who for years had spread his stall under the shelter of the same buttress of the church or town-hall, began to rest a fixed wooden booth against it, gradually transforming the timber beams into lath and plaster, or even into brick or stone, until at length the basement of the stately cathedral or *hôtel de ville* was incrustated all over with unseemly little booths (or *kramas*, as they were called in Scotland), like limpets on a rock. The booth which thus arose had often but one apartment, opening on the street by a narrow door, and a broad unglazed window, closed at night by a wooden shutter, dividing in the middle, and hinged at top and bottom, so that the upper half formed a sort of awning, while the lower half served as a table for the display of the trader’s wares. It was at this window that business was conducted, the trader standing within, the buyer without. Traces of the middle-age booth still remain in this country, and in France there are many perfect examples, some believed to be of the 12th century.

Booth, BARTON, a celebrated 18th-century actor, born in 1681, the son of a Lancashire squire, nearly related to the Earl of Warrington. He received a good education at Westminster, and was just about to be sent to Cambridge when he chose a career for himself by becoming an actor. He first offered his services without success to Betterton, then played for two seasons at Dublin. A fresh application to Betterton was more successful, and in 1700 he appeared as Maximus in *Valentinian*, in Lincoln’s Inn Fields, London, and was soon a favourite. His performance of Cato in Addison’s tragedy in 1713 brought him wealth as well as fame. Other great Shakespearean parts were Henry VIII., Othello, Brutus, and Hotspur, and Lothario in Rowe’s *Fair Penitent*. He died 10th May 1733.

Booth, CHARLES (1840-1916), born at Liverpool, was by 1862 partner in a Liverpool firm trading to Brazil. He earned gratitude by the

laborious researches he organised and digested into *The Life and Labour of the People of London*, a report published in 17 volumes between 1889 and 1903, and designed primarily to show 'a numerical relation which poverty, misery, and depravity bear to regular earnings and comparative comfort'; the religious influences fill an important volume in a work which required the services of many enumerators. Booth published besides a volume on *The Aged Poor in England and Wales* in 1894, and works on old age pensions (1891, 1899). He was a commissioner on tariff reform (1904), and a Privy-councillor. See Life by his wife (1918).

Booth, JUNIUS BRUTUS (1796-1852), the son of a London lawyer, went on the stage at seventeen, and became famous as Richard III. at Covent Garden. In 1821 he migrated to the United States, where, after thirty years of successful work, he died suddenly on board a Mississippi river steamer. He had long been subject to a natural eccentricity, which, at times, when aggravated by domestic affliction or habits of intemperance, developed into temporary insanity. —His son, **EDWIN THOMAS BOOTH**, American actor, was born in Harford county, Maryland, November 13, 1833. When sixteen years of age, he made his first appearance on the stage, in the part of Tressel, his father acting as Richard III. Two years later he himself successfully assumed the part of Richard in place of his father, who unexpectedly refused to fulfil an evening's engagement. The following year the two went to California, where the son remained for several years, visiting Australia meanwhile. Meeting with little pecuniary success, in 1856 he returned to the Atlantic states, and from that time thenceforward was recognised as a leading member of his profession. He visited England (1861-62), and in 1864 produced *Hamlet* at New York for 100 nights consecutively. In 1869 he opened a splendid theatre in New York, whose building cost over a million dollars, but which involved him in pecuniary ruin. He revisited California in 1876, and in the spring of 1877 was able to settle with his creditors, having earned during the season over £120,000. Booth visited Great Britain and Germany in 1880-82, and was everywhere received with enthusiasm. He died at New York, 7th June 1893. See his *Life and Art* by William Winter (1894). —**JOHN WILKES BOOTH**, another son of Junius Brutus Booth, was born at Baltimore in 1839, and was an unsuccessful actor. In 1865 he entered a conspiracy to avenge the defeat of the Confederates, and shot President Lincoln (q.v.). He broke his own leg, but managed to escape to Virginia and conceal himself till 26th April, when he was tracked, and, refusing to surrender, was shot.

Booth, REV. WILLIAM (1829-1912), founder and 'general' of the Salvation Army (q.v.), was born at Nottingham, was educated there, and from 1850 to 1861 acted as minister of the Methodist New Connection. From the first he was zealous in holding evangelistic services, but the new departure which led to the creation of the Salvation Army on military lines began in 1865 with mission work among the lower classes in the East End of London. Since 1878 Booth's movement has been known as the Salvation Army, of which he continued to be the mainspring and controlling power, directing its movements at home and abroad from his headquarters in London. His enthusiasm and wonderful organising power gave life to the religious military system, of which he was really 'general.' He wrote *Darkest England and the Way Out* (1890). See Lives by G. S. Railton (1912) and Begbie (1920). His wife (1829-90) was fully associated with him in the movement and the publications dealing with it. See the Life of Mrs Booth by

Booth-Tucker (1892), and the works quoted at SALVATION ARMY.

Boothia Felix, a peninsula on the north coast of North America, in which is the most northern part of the continent, Murchison Point, 73° 54' N. lat. It is joined to the mainland by Boothia Isthmus, is bounded on the N. by Bellot Strait, and to the E. is separated from Cockburn Island by Boothia Gulf, a southward continuation of Prince Regent's Inlet. It was discovered by Sir John Ross (1829-33), and named after his liberal friend Sir Felix Booth (1775-1850), a London distiller, who had furnished £17,000 for the expedition. Here, on the western coast, near Cape Adelaide, Ross discovered the magnetic pole, 70° 5' 17" N. lat., and 96° 46' 45" W. long.

Bootle-cum-Linacre, a parliamentary and county borough adjoining Liverpool, with a municipal technical college, and a great part of the Mersey dock system; pop. (1861) 6500; (1881) 27,112; (1891) 49,217; (1921) 76,508.

Booton, or **BUTUNG**, an island of the Malay Archipelago, separated by a narrow strait from the south-eastern ray of Celebes, and from the island of Muna. Area, 1700 miles. It is high, but not mountainous, and thickly wooded, produces fine timber, rice, maize, sago, &c. The people are Malays. The sultan, who resides at Bolio, is in allegiance to the Dutch, an under-resident being stationed on the island. Pop. 17,000.

Boots and Shoes. The foot-coverings of the human family are exceedingly varied in form, and they are not less diverse in the material out of which they are made. These differences are not merely due to the caprices of fashion and the influence of traditional costume and habit, but they owe their existence in large measure to the conditions of climate, and to the necessities of the daily life and occupations of their wearers. It must be at once obvious that the foot-coverings which would be sufficient and healthy amid tropical sands, would be most unsuitable for withstanding the rigours of a Greenland winter. The lightest sandal, which simply defends the sole of the foot, is appropriate for the one condition, while the other demands the closest, most warm, and water-tight covering which can be devised. The elementary foot-covering is the sandal, which consists only of a pad or sole shaped to the sole of the foot, and held on by straps or thongs. From the sandal grows up the slipper, in which straps and lacing are dispensed with, and a sufficient 'upper' of leather or other soft material is provided to keep the article on the foot. The ordinary short shoe is the next development, it being laced, buttoned, or otherwise fastened on the foot; and in the boot the upper is continued so as to embrace more or less of the leg.

The sandal is the most ancient foot-covering of which we have any record, and examples of very ancient manufacture, taken from Egyptian mummies, are preserved in public collections. The shoe frequently referred to in the Old Testament, and which played an important part in buying and selling, and in other social usages, was a sandal.

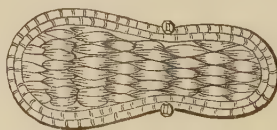


Fig. 1.



Fig. 2.

The common sandal of the ancient Egyptians (fig. 1) consisted of stripes of papyrus plaited into a kind of mat, and that form remains the type of sandal

of plaited grass or straw worn to this day by multitudes in Central Asia, India, China, and Japan. The sandal was the ordinary shoe of the ancient Greeks, an ornamental example of which is shown in fig. 2. In Greece, shoes were used only in exceptional circumstances, and long boots lacing up the front were worn by hunters. Sandals (*soleæ*) were the everyday wear of the Roman populace; the patricians wore shoes (*calcei*) of black leather; red leather shoes were reserved for senators; and the long boot or 'buskin' (*cothurnus*), reaching sometimes to near the knee, and frequently supplied with a thick sole to add to the apparent stature of its wearer, was appropriated to tragedians and hunters. Sandals and slippers continue to this day to be the staple foot-gear of oriental communities, and great wealth of ornamentation—inlaying of wood in sandals, and elaborate embroidery in gold and coloured silks, with fantastic curling of the toes—are characteristics of the richer productions of the eastern tradesmen.

In medieval times, shoes with long pointed toes were worn by the high-born; and towards the end of the 14th century these points became ridiculously elongated, so that there appeared to be a long strap projecting from each foot. Different kinds of half-boots were worn by the Anglo-Saxons and Anglo-Normans; and in the reign of Edward IV. the boot proper, with tops and spurs, was established



Fig. 3.
Jack-boot.

as an article of knightly dress. In the reign of Charles I. the jack-boot, as it is called (see JACK), became indispensable in the costume of cavalry soldiers and horsemen generally. Fig. 3 is a representation of this highly characteristic boot, which we readily associate with the civil and foreign wars that distracted the 17th century. This huge species of boot remained in use in British cavalry regiments until comparatively recent times. The jack-boot is almost entitled to be called the parent of the top and some other varieties. Boots with

tops of a yellow colour were so commonly worn by gentlemen in the 18th century as to become a peculiarity in the national costume of the English. Among jockeys and fox-hunters top-boots are likely to remain in permanent use. What perhaps contributed to break up their general use was the introduction of the Hessian boot as an article of walking-dress. Worn over tight pantaloons, the Hessian boot was a handsome piece of attire, giving, undoubtedly, an elegant appearance to the nether costume. A representation of a Hessian boot, with its tassel, is seen in fig. 4. Boots of this shape were worn by English general officers in the early part of the French war and somewhat later. At length they were superseded by the well-known Wellington boot, which, as its name



Fig. 4.
Hessian Boot.

imports, was introduced by the great Duke, as a simplification, under the loose military trouser. The Wellington was almost entirely abandoned in England in consequence of the universal use of short ankle-boots. It is still largely used in some continental countries and in the United States.

Wooden shoes (*sabots*) are a feature of continental life, and are worn in certain industries in the United Kingdom.

The making of overshoes of india-rubber is a large factory industry, especially in the United States,

where the use of 'gum' shoes, as they are called, is almost universal. Factory shoes with soles of

gutta-percha also came into use about the middle of the 19th century. The tendency of the material to soften and spread with heat was a serious disadvantage, partly overcome in balata soles, in which the material is covered with canvas.

The shoemaking industry of the United Kingdom, which has to do principally with boots and shoes made of leather, is divided into two departments—one the old handicraft, the other a factory industry. For many reasons the ancient domestic craft of shoemaking is dying out. Machinery and appliances for every operation are being gradually perfected, and although no machine work can equal in combined solidity and elasticity the productions of a first-class craftsman, superior operatives are comparatively scarce, and the products of the factory are at least even in quality, and much cheaper than hand-made boots and shoes.

Shoemaking as a handicraft is a sedentary and contemplative industry. The foot to be fitted being duly measured, the upper leathers are cut out and sewed together, an operation called 'closing.' The 'stuff' for the soles is then cut out of tanned ox-hide, the pieces being the insole, the outsole, and the lifts of the heel. These are steeped in water; a last or foot-model suitable for the boot or shoe to be made is chosen, and to the bottom of it the insole leather is nailed; and then by pulling and hammering it is moulded accurately to follow the contour of the last-sole. The edges of the insole are then pared and rounded down; the upper is drawn tightly down over the last, and its lower edge is nailed temporarily over the edge of the insole. A narrow strip of leather, the welt, sufficient to run round the whole sole excepting the heel part, is then selected, and the three edges, sole, upper, and welt, are by an in-seaming stitch sewed together. The welt then forms a band to which the outsole is sewed around the edges. The heel lifts are built up, and sewed and nailed together; and thereafter the finishing operations include the burnishing of the sole and edges, the insertion of eyelets or buttons in the uppers, &c.

The shoe-trade as a factory industry only grew with the development of the sewing-machine, and now, except for repairing, there is scarcely such a thing as hand-sewing in the uppers of shoes. The great difficulty which, apart from hand-sewing, at first lay in the way of applying machinery to shoemaking was in the fastening together of the sole and the uppers. Early in the 19th century one Randolph, and a little later, the celebrated engineer, Sir M. I. Brunel, patented methods of fastening together soles and uppers by means of metal pins and rivets. The upper leather was drawn well over the insole, the outer sole was then applied, and the whole pinned together and riveted by the point of the pins coming against, and being turned by an iron-shod last inside. The germs of the modern sewing-machine were embodied in a patent secured in 1790 by Thomas Sant, the object of his invention being to sew boots and shoes; but the sewing-machine was not applied to boot-making till after its success in ordinary stitching was demonstrated. A machine for sewing together soles and uppers was patented in America by Blake, and as subsequently improved by Mackay, it became the apparatus which, for the period during which the patents were current, dominated the factory shoemaking industry. The Blake-Mackay machine sewed through outsole, upper, and insole at one operation; but as the corporation owning the machine held the patent right for machine-sewed boots and shoes, improvements by outsiders were for the time barred. Now there are in operation many varieties of sewing-machines, some of which sew welted boots in all respects like the hand-made product.

Factory-made boots and shoes are now entirely cut out by machinery; the uppers are sewn by strong sewing-machines, and soles and uppers are fastened together either by (1) sewing, (2) pegging with wooden pegs, (3) riveting with metal pins, or (4) screwing by means of the Standard screw machine. The latter most ingenious apparatus uncoils a reel of screwed brass wire, inserts it into the sole, and cuts off the wire flush with the outsole with remarkable rapidity.

Booty is the victors' share in property captured from the vanquished. In the British army all booty belongs to the sovereign, and is distributed as his advisers may direct. Most regiments have amongst their treasures articles of the nature of booty or 'loot'—plate, bric-à-brac, heathen deities, &c. Booty on a large scale may be sold and the value apportioned. The authorised sacking of the Chinese Summer Palace in 1860 was a notable instance of looting. Booty is not recognised officially in the army of the United States. The loot seized (both by soldiers and civilians) at the siege of Peking in connection with the Boxer rising in 1900 was for the most part restored to the Chinese government. Prize or prize-money is the word used in the British navy; see PRIZE.

Boporo, an inland native town of Liberia, 80 m. N. by E. of Monrovia.

Bopp, FRANZ, the distinguished philologist, was born at Mainz, 14th September 1791. By the lectures of Windischmann, he was led to devote himself to the study of oriental languages, a study which he continued with Chézy, De Sacy, and A. W. Schlegel at Paris. Here he composed his first work on *The Conjugation of the Sanskrit Verb* (1816), in which he scientifically demonstrated the original community of the Indo-European languages. He next removed to London, aided by a small pension from the King of Bavaria, where he published an improved edition of his previous work, and at the same time edited several episodes from the Mahābhārata. He returned to Germany in 1821, and some years after received the appointment of professor of Oriental Languages at Berlin, where he remained till his death, which took place 23d October 1867.

During these years he published his great work, *A Comparative Grammar of Sanskrit, Zend, Greek, Latin, Lithuanian, Old Slavonic, Gothic, and German* (1833-52); in a new edition he added Old Armenian. A final edition was published after his death (1871). It was translated into English by Eastwick (3d ed. 1862). In this work he elaborated his theory of the origin of grammatical inflection. According to this all the words of the Indo-European languages are derived from *monosyllabic* roots which are of two kinds, *verbal* and *pronominal*, and by the addition of one or several of such roots to another root, grammatical inflection is produced. Bopp further held that this stage of language, which has been called the *agglutinative*, was prior to the separation of the Indo-European languages, and that their succeeding history was one of phonetic decay, not of growth. It is in the treatment of this part of the history of language that Bopp is at his weakest. He allowed himself great latitude in dealing with phonetic laws, and finally showed he had no true method at all when he made the unfortunate attempt to connect the Malay-Polynesian languages (1841) with the Indo-European.

Besides the works mentioned above, Bopp wrote monographs on the Celtic, Caucasian, Old Prussian, and Albanian languages, as well as a Sanskrit grammar and glossary. See Life by Lefmann (1892-97).

Boppard, a town of Rheinland, on the left bank of the Rhine, 10 miles S. of Coblenz. The

Baudobriga of the Romans, it was afterwards an imperial city till 1312, and the seat of a diet in 1234. Pop. 6000.

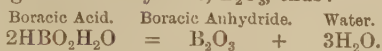
Bora, a strong, cold, and dry, north-east wind, which often rages with great severity in the Upper Adriatic, especially in winter, sometimes for eight or nine days together. Diez explains the word as a Milanese form of Italian *borea*, 'north wind,' from Lat. *boreas*; others identify it with an Illyrian *bura*, 'storm,' of Slavonic origin.

Bora, KATHARINA VON, the wife of Luther, was born of an old family in the district of Meissen, 29th January 1499. At a very early age she entered the Cistercian convent of Nimptschen, near Grimma. Becoming acquainted with Luther's doctrines, she found herself very unhappy in her monastic life; and finally, along with eight other nuns, whose relatives, like her own, refused to listen to them, she applied for assistance to Luther. Luther obtained the services of Leonhard Koppe, a citizen of Torgau, and by him and a few associates the nine nuns were liberated from the convent in April 1523. They were brought to Wittenberg, and Katharina became an inmate in the house of the burgomaster Reichenbach. Luther, through a friend, Amsdorf, offered her the hand of Dr Kaspar Glaz. She declined this proposal, but declared herself ready to marry Amsdorf, or Luther himself. Her marriage with Luther took place on 13th June 1525. She bore her husband three sons and three daughters, and is best described in Luther's own words as 'a pious, faithful wife, on whom a husband's heart could rely.' She died 20th December 1552 at Torgau. See lives of her by Stein (3d ed. 1886) and Thoma (1900), and the lives of Luther (q.v.).

Boracic Acid, or BORIC ACID, is found native (1) in the steam or vapour which rises from certain volcanic rocks in Tuscany, (2) as the mineral Sassolite, occurring largely in California, and (3) as a saline incrustation in the crater of a mountain in the island of Volcano, in the Lipari group, 12 miles N. of Sicily. Boracic acid also occurs in combination in Borax (q.v.), Datholite (q.v.), Boracite (q.v.), ulexite, colemanite, and other minerals, and to a very minute extent in trap rocks generally. The plan of collection pursued in Tuscany is to form a series of caldrons—100 to 1000 feet in diameter, and 7 to 20 feet deep—partly by excavation, and partly by building, in the side of the volcanic mountain where the steam and boracic acid vapours are issuing from fissures, and divert the course of a mountain stream, so that at pleasure the caldrons or *lagoons* may be supplied with water. As the volcanic vapours gurgle through the water contained in the lagoons, the boracic acid is arrested by the water, which becomes impregnated with it. The liquid is passed from one lagoon to another, then on to settling-vats and flat-bottomed evaporating pans, till it becomes so concentrated that on cooling, impure crystals of boracic acid separate. In this condition it is exported.

Much boracic acid has been found in California in ulexite, a native borate of lime and soda, and in colemanite, a native borate of lime. The latter yields the largest amount of boracic acid obtained on the Pacific coast. Native boracic acid is employed as a source of Borax (q.v.), and contains about three-fourths of its weight of true boracic acid, accompanied by one-fourth of water and impurities. In a pure condition boracic acid may be prepared by dissolving forty parts of borax, $\text{Na}_2\text{B}_4\text{O}_7$, in one hundred of water, and acting thereon by twenty-five parts of hydrochloric acid, HCl, which removes the soda, forming chloride of sodium, NaCl, and water, H_2O , and on cooling the mixture, the boracic acid, HBO_3 , crystallises out.

On re-solution in water and re-crystallisation, it is obtained in pure white feathery crystals. These crystals have the composition of $\text{HBO}_2 \cdot \text{H}_2\text{O}$, and on heating lose the whole of the water they contain, yielding boracic anhydride, B_2O_3 , thus:



Boracic acid is one of the 'weak' acids; i.e. in solution it is very slightly ionised. Boracic acid is used in the arts as a flux, and as an ingredient in the glaze employed in pottery; and the wicks of stearine and composite candles are treated with it, so that when the candle is burning, the end of the wick, when it gets long, may fuse and fall to the side, where it can be burned away. As an antiseptic and preservative of food, boracic acid is extensively employed, either alone or along with borax. An ointment, called 'Lister's Ointment,' of great antiseptic power, is prepared from boracic acid, wax, and paraffin. In the preservation of butter, milk, wine, beer, meat, and fish, it is probably used to a greater extent than any other antiseptic. There have been many experiments made in order to ascertain whether borax and boracic acid are injurious to the health. Elaborate tests were gone through by Dr Wiley on many individuals in the United States. Dr Wiley proved that when continuously taken as a preservative in food, they undoubtedly disturbed the digestive system. On the other hand, some observers favour the view that little or no harm results to the health from continuous consumption in small quantity. Boracic acid is volatile when its solution in water or alcohol is evaporated, and when alcohol containing it is ignited, the flame has a green colour characteristic of boracic acid.

Boracite, a mineral consisting of magnesium borate and chloride ($\text{Mg}_7\text{B}_{10}\text{Cl}_{30}$). When heated it becomes positively electrified on four cube-corners, negatively on the other four. Its crystals, apparently of the cubic system, are really birefringent, and built up of a number of individuals. At a temperature of 265° they suddenly become isotropic, and lose their pyroelectric quality.

Borage, *Borago* or *Borrigo*, a genus of Boraginaceæ (q.v.), of which the three species are



Common Borage (*Borago officinalis*):
a, a flower.

all natives of the countries around the Mediterranean. The Common Borage (*Borago officinalis*) is

found in waste places in many parts of Europe, and is pretty frequent—no doubt naturalised—in Britain. It is a herb of somewhat stout and coarse appearance, but is easily recognised by its scorpioid cymes of few large ($\frac{3}{4}$ inch) beautiful blue flowers with purple-black anthers, spurred at the back. Borage was formerly much cultivated and highly esteemed, being reckoned amongst the *cordial* flowers, and supposed to possess exhilarating qualities, for which it no longer receives credit. The belief in its virtues was at one time extremely prevalent in England, its very name being, according to some, a corruption of *corage*, and its use correspondingly universal. The flowers were put into salads, Gerard tells us (1597), 'to make the mind glad'; and he adds: 'There be also many things made of them, used everywhere for the comfort of the heart, for the driving away of sorrow, and increasing the joy of the mind.' It was also frequently put in wine, and although it has no sensible properties, its traditional virtues still retain for its leaves a place in the preparation of claret-cup. The young leaves and tender tops are pickled, and occasionally boiled for the table, and are still used in salads in Germany.

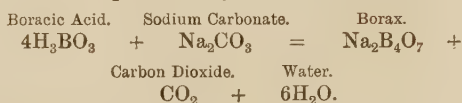
Boraginææ, or BORAGINACEÆ, a chiefly herbaceous order of sympetalous dicotyledons, the alternate exstipulate leaves generally rough with hairs which proceed from a thick hard base (whence the old name *Asperifoliæ*), and the whole plant mucilaginous and emollient. The inflorescence is usually a scorpioid cyme; the calyx and corolla 5-lobed regular; the stamens epipetalous and alternate; and the primitively 2-lobed ovary in the Boraginoideæ becomes early divided into four 1-seeded nutlets, much resembling those of Labiata (q.v.), and with a single gynobasic style. The other groups (Cordioideæ, Ehretioideæ, Heliotropioideæ) differ from the Boraginoideæ chiefly in the fruit, which in the more typical species is a succulent drupe, or in the Heliotropes consists of four dry achenia more or less consolidated; and in having a terminal style.—There are about 1200 known species. The Boraginoideæ are natives principally of temperate climates, the others mainly tropical. Borage (q.v.), Alkanet (q.v.), Comfrey (q.v.), and Forget-me-not (q.v.) are examples of the Boraginoideæ; Heliotrope (q.v.) of the Heliotropioideæ. The colour-changes of the flowers are interesting.

Borås, a Swedish town, on the Wiske, 36 miles E. of Gothenburg; it dates from the days of Gustavus Adolphus, but has of late rapidly grown by reason of its large cotton-mills; pop. 28,000.

Borassus. See PALM.

Borax, or BIBORATE OF SODA, is found native as a saline incrustation on the shores of certain lakes in Persia, Tibet, Nevada, and California, but it also occurs widely scattered over the world. It has been long known, but it was not till 1732 that its chemical nature was ascertained. At first, and till comparatively recent years, the main source was the crude article brought from Tibet in skins, and going by the name of *tincal*. As so obtained, the crystals were coated with a greasy matter, said to be derived from the skins, and this had to be first removed by means of soda before the borax could be refined. In 1856 the Californian sources of borax were discovered, the bottom of a lake being found to be covered to a depth of about 18 inches with a mud impregnated with borax, and containing large crystals of it. From this mud, by treatment with hot water and crystallisation, there is first obtained *concentrated* borax, and by further treatment this yields the *refined* borax. In other places in California the borax is found mixed with sand in a light granular form, containing

about $\frac{1}{3}$ th of the pure salt, while large crystalline masses of it occur below the surface of the ground. In all these cases a similar method of purification is adopted. The most important deposits now worked in California are the 'colemanite' (calcium borate) in the Mojave Desert. The colemanite is readily dissolved by sodium carbonate solution, when the borax crystallises out. To reduce the amount of transportation, the Pacific coast borax is made of high quality, one pound being equal to three pounds of ordinary borax. In Europe large quantities of *artificial* borax are prepared from the Boracic Acid (q.v.) of Tuscany. This, mixed with carbonate of soda, is heated in a furnace, carbonic acid being liberated, and the crude salt is then dissolved in water to free it from impurities, and crystallised. The changes which take place in this operation are represented by the following equation :



The common variety of borax contains ten equivalents of water (water of crystallisation), $\text{Na}_2\text{B}_4\text{O}_7 + 10\text{H}_2\text{O}$, and forms prismatic crystals; but another variety exists, known as *octahedral* borax, and containing only five molecules of water. Borax is soluble in twelve times its weight of cold water, and in half its weight of boiling water, yielding a clear solution with a slightly sweetish taste. It is of great use in the chemical arts owing to its properties of dissolving metallic oxides, and of forming a flux when heated with other substances. On this account it is much used in connection with the Blowpipe (q.v.), before which it yields different coloured 'glasses' corresponding to the metals present. It is also employed in the manufacture of enamel, and for glazing or coating vessels in pottery, as also in the formation of the paste for artificial gems. To the metallurgist it is an aid in the readiness with which it promotes the fusion of metallic mixtures, and the separation of the metals; and to the solderer it is of service in forming a thin glassy coating over the edges of the metals, which prevents their oxidation at the time they are being joined together. It is used as a mordant in calico-printing; while as an adjunct to, or substitute for, soap in washing, it gives satisfactory results in the proportion of $\frac{1}{2}$ lb. to 10 gallons of water. For the toilet, borax in solution is invaluable, making in itself an admirable shampoo, while its utility for cleaning brush and comb is well known. A varnish prepared by boiling together one part of borax and five of shellac with water is used for stiffening hats; and as an insecticide it is very powerful, being specially destructive to cockroaches. For preserving meat, fish, butter, and milk, either alone, or along with Boracic Acid (q.v.), borax has a wide application. Besides these technical uses, borax is much used in medicine as an antiseptic, being applied either in powder or as lotion. For ulcerating surfaces, and in the treatment of the infantile disease thrush, it is extensively applied; while throat lozenges, designed to relieve the hoarseness of public speakers, generally contain this valuable salt as a constituent.

Borda, JEAN CHARLES DE, mathematician and astronomer, was born in 1733 at Dax, in the French department of Landes. As early as 1756 his *Mémoire sur les Projectiles* procured him admission to the Academy of Sciences. Entering the navy, he busied himself with nautical, astronomical, and hydraulic investigations, and suggested great improvements in the form of vessels. In 1777-78 he did good service in the American war; in 1782

he was captured by the English on the voyage home from Martinique, but was permitted to return on parole to France, where he entered the ministry of marine. He died at Paris, 20th February 1799. He was a leading member of the commission entrusted with the measurement of a meridian arc; and he rendered essential service to the new system of weights and measures.

Borde. See BOORDE.

Bordeaux, a great seaport of France, and the chief town in the department of Gironde, is beautifully situated in a plain on the left bank of the Garonne, about 60 miles from its mouth in the Atlantic, and 359 miles SSW. of Paris by rail. Transatlantic steamers can easily ascend with the flood to Bordeaux. The commerce both by the Garonne and by railways is very extensive, and its long and crescent-shaped harbour has a singularly noble appearance. But the quay accommodation is limited; most of the ships have to anchor in the stream, exposed to very high and swift tides. In 1867-79 a spacious dock was constructed at the lower or northern end of the town, with a depth at ebb-tide of 22 feet, and an area of almost 25 acres; and in 1888 the construction of stone embankments, iron jetties, and other improvements was commenced. Port extensions were begun in 1907. In 1913 a new dock of 15 acres' water area was opened on the left bank. Other improvements are the deepening of the river, and extension of existing quays and docks. The river is crossed by a noble bridge of 17 arches and 532 yards in length, erected in 1811-21. The old Canal du Midi connects Bordeaux with the Mediterranean. The old town has narrow crooked streets; but the newer parts of the city and the suburbs have wide streets, fine squares, and pleasant promenades lined with trees. In spite of damp winters and oppressive summers, and an imperfect drainage system, Bordeaux is a healthy town. The cathedral of St André, which was consecrated in 1096, is remarkable for its beautiful towers, designed and built, it is said, by English architects during the English occupation. Ste Croix dates from the 10th century, and St Seurin is also very ancient. Several handsome large churches have been built since 1868. Bordeaux is the seat of an archbishop, and of a university with faculties of science, letters, medicine, and law; of schools of theology, art, and navigation, an academy of arts and sciences, a valuable gallery of paintings, a museum, and an observatory. The Grand Théâtre is one of the largest and finest buildings of its kind in France. Pop. (1872) 190,682; (1901) 257,471; (1911) 261,678; (1921) 267,409.

The principal industries are connected with the wine trade, the making of brandy, liqueurs, vinegar, sugar, tobacco, printed calicoes, woollen goods, casks, paper, earthenware, glass bottles, capsules, labels, and chemical products. Wine, brandy, vinegar, fruit, fish, lace, jewellery, ready-made clothing, and skins are among its principal exports, the largest trade being with England and South America. Bordeaux is an important centre of the French cod-fishing ships for Newfoundland, Iceland, and elsewhere.

Except those of Champagne, no French wines have been so much exported to foreign countries as those grown in the department of Gironde, especially the Médoc, and known as Bordeaux wines. Some of them are red (known in England as *Claret*), others white. The finest red wines are produced by the vineyards of Château-Lafite, Château-Margaux, Château-Latour (all Médoc wines), and Haut-Brion, the best from the Graves district; St Julien and St Estèphe are of the

second rank; the St Émilien wines are a distinct group. Of the white wines, the Château d'Yquem is the finest of *Sauternes*, others being *Bommes*, *Barsac*, *Preignac*. *Graves* is a commercial name for the sweeter white wines of the left bank of the Gironde. During the struggles with the phylloxera, oidium, and mildew (the latter combated successfully with 'Bordeaux mixture' or solution of copper sulphate and lime), large quantities of wine were imported from Spain and Sicily.

Burdigala was the capital of the *Bituriges Vivisci*, and being made by Hadrian the capital of *Aquitania Secunda*, it became both the principal emporium of the south-west of Gaul and the seat of its best educational institutions. The so-called palace of Gallienus is the ruin of a Roman amphitheatre. The town shared the fate of *Aquitania*, and suffered successively from Vandals, Goths, Franks, and Moors. It was taken by Charles Martel in 735, but was again spoiled by Norman plunderers in the 9th century. It became the capital of the Duchy of Guienne, and in 1152 passed, by the marriage of Eleanor of Guienne with Henry of Normandy (afterwards Henry II. of England), under the dominion of England. Edward the Black Prince for a considerable time held his splendid court in Bordeaux, but it was restored to France in 1451. It was the seat of the Collège de Guyenne. During the Revolution it was the principal strength of the Girondists, and suffered fearfully at the hands of the Terrorists. Its inhabitants were the first to declare for the Bourbons in 1814. During the Franco-Prussian war, the first sittings of the National Assembly in 1871 were held here; and it was the seat of the French government during part of the Great European War. Bordeaux was the birthplace of Richard II. of England, the poet Ausonius, and Rosa Bonheur.

Bordeaux, HENRY, French novelist and Academician (1919), born at Thonon (Haute Savoie) in 1870, studied law before writing *La Peur de Vivre* (1902), *Le Lac Noir* (1904), *Les Roquevillard* (1906), &c.

Bordelais, the country round about Bordeaux, was a division of Guienne.

Borden, SIR ROBERT LAIRD, G.C.M.G. (1914), born at Grand Pré in 1854, became a barrister and K.C., practising in the Nova Scotian courts and the Supreme Court of Canada. He entered parliamentary life (for Halifax) in 1896, and in 1901 was chosen leader of the Conservative party in the Canadian House of Commons. When Laurier's government sought commercial reciprocity with the United States in 1911, it was routed, and Borden became the head of a Conservative ministry. He organised Canada for war, and was the first overseas premier to attend a cabinet meeting in London. His Coalition ('Union') government, formed in 1917, was sustained by a general election. He retired in ill-health in 1920.

Bordentown, a city of New Jersey, on the Delaware, 6 m. SE. of Trenton, has iron-foundries, machine-shops, shipyards, and worsted mills; pop. 4400.

Borders, the tract of country lying immediately on both sides of the frontier line between England and Scotland, which runs north-east and south-west, between the head of the Solway Firth and a point a little north of the mouth of the Tweed, the counties touching upon this line being Cumberland and Northumberland on the English side, and Dumfries, Roxburgh, and Berwick on the Scottish side. The distance between the two extremities is nearly 70 miles as the crow flies; but, following the frontier line in its irregularities, about 110 miles.

The line of division is for the most part a natural one. The middle portion, extending 35 miles, is formed by the high barrier of the Cheviot range, the watershed of which may be regarded as in general the line of division. Leaving the Cheviots in the south-west, the line descends for nearly 22 miles by the Kershope Burn, and the waters of the Liddel, the Esk, and the Sark, to the Solway Firth. From the north-east extremity of the Cheviots, the windings of the Tweed, for about 13 miles eastward, form the natural boundary. But at a point about 5 miles from the mouth of that river the line strikes out semicircularly in a north-easterly direction, till it reaches the east coast a few miles north of the town of Berwick-on-Tweed, the space thus enclosed, embracing within it what are known as the 'Liberties' of that town, having been at one time regarded as neutral territory between the two kingdoms. On the western Border, near the Solway, was a corresponding tract of country claimed by both kingdoms, and hence called the 'Debateable Land.'

While the above may be taken roughly as defining the Border in the geographical sense, the word has for *historical* purposes a wider signification, especially on the Scottish side. In old Scots acts of parliament applying to the Border district, and in general in Scottish history, the counties of Selkirk and Peebles, though they nowhere touch the frontier line, are embraced within the term. While, therefore, the southern limit of the English Border may be defined by a line drawn from Carlisle to Newcastle, following nearly the route of the Roman Wall, the Scottish Border may for historical purposes be described as a truncated or rounded triangle, its base-line extending from Wigtown Bay on the west to the mouth of the Tweed on the east, the apex reaching the town of Peebles, nearly 40 miles from the Cheviots.

There is yet a third and more popular sense in which the word Border is used, here again affecting the Scottish side. This, which may be called the *literary* sense of the term, arises out of the extraordinary prominence which has been given to the vale of the Tweed, including its tributaries the Yarrow, the Etrick, and the Teviot, by the splendid romances and poems of Sir Walter Scott, by the poetry of Leyden and the Etrick Shepherd, by the ancient and traditional ballads relating to the district, and by the pathetic songs and legends more immediately connected with the Yarrow, and glorified by the genius of Wordsworth. While, indeed, all these three senses of the word—the geographical, the historical, and the literary—fall to be recognised in any formal treatise on the subject, it must be admitted that in ordinary usage the third or literary sense predominates. Hence, when Border tales or Border ballads or Border traditions are spoken of, it is the Scottish rather than the English side of the frontier that is referred to.

Although the name of the Border, or Borders, is not perhaps older than the 13th century, it is of interest to note that from the very dawn of British history the district so called has exhibited in its annals the characteristics of a frontier or borderland, in so far as it has almost constantly formed the boundary or point of contact between contending races and nations. It is first made known to us by Tacitus as part of the kingdom of Brigantia, or the territory of the Brigantes—probably a Welsh-speaking race of Celts—who ruled all the country between the Humber and Mersey as far north as the Firth of Forth. They were a strong, courageous, and warlike people, able for many years to keep the Roman cohorts at bay, and thus to serve as a check upon the northward progress of the invaders. The great earthwork which runs almost parallel with the

Roman Wall between Carlisle and Newcastle may have been erected, not by the invaders, as hitherto supposed, but by these native tribes, as a barrier against the advance of the Romans. It faces south, and is therefore presumed to have been built as a defence against the south. If so, we have here a defined frontier line as far back as the 1st century of the era. The district immediately to the north of this line and the Solway Firth was subsequently, however, conquered by Agricola, and held by the Romans until their departure, though not without many insurrections on the part of the natives. The district then became the common battle-ground successively of Picts and Britons and Angles, until the 6th century, when we again find it appearing in history under the name of Bernicia, and occupied (as it has been ever since) by an English-speaking people. Bernicia, in the succeeding century, was conjoined with Deira to form the great kingdom of Northumbria, which kingdom, as Brigantia had done, included all the territory between the Humber and the Forth. From the 7th to the 11th century what we now call the Border district still continued to be the meeting-point of hostile races, the Scots of Dalriada and the Picts, and latterly the Scots alone, contending, now with the Angles, and now with the usurping Danes, for the possession of the country watered by the Tweed. At length, in 1018, the Scots, under Malcolm II., defeated the Angles of Northumbria in a great battle at Carham, near Coldstream, whereupon the Northumbrians ceded to the Scots the district then known as Lothian (q.v.), that is, the whole of the territory between the Tweed and the Forth. The Scots afterwards obtained possession also of Cumberland, but this was wrested from them by William Rufus in 1092. The Tweed, however, still remained as the boundary between England and Scotland on the eastern Border, until the frontier was finally adjusted, much as it exists, by a commission of both countries in 1222.

From the time of the rise of the Celtic dynasty of Scottish kings in the person of Malcolm II. a change for good is observable in the condition of the Scottish Border. Under his descendant, Malcolm Canmore, the aristocracy was strengthened by the settlement of noble Saxons and Normans; and by David I. were planted the great religious houses of Kelso, Melrose, Jedburgh, and Dryburgh, which could not fail to have a civilising and ameliorating effect upon the people and the country. On the English side the church had a less vigorous growth, having no such munificent patron as King David, yet there also it could boast of the fine cathedral of Carlisle, the Premonstratensian abbey of Alnwick, the ancient monastery and priory of Hexham, and the still more ancient and classic shrine of Lindisfarne or the Holy Island. The Scottish side of the Border made, moreover, at this time a great advance as compared with the English side. This advance was due not a little to its physical superiority. Northumberland, which marches with Scotland for fifty miles, and almost of itself constitutes the English Border, was mostly, with the exception of the south-eastern portion, a barren and bleak country. Even now, its western and northerly parts, with their high and uncongenial exposure, are little better than moorlands. The soil, being cold and wet and sour, is unfavourable to plant-life, and for miles on miles, in some places, scarcely a tree is visible. On the other hand, the Scottish Border, with its broad and fertile valleys fed by numerous streams, its valuable woodlands, and its green hill-pastures, was extremely favourable, notwithstanding its exposure to hostile inroads, for the settlement and support of a numerous and thriving population. Hence Berwick and Jedburgh and Roxburgh rose in the 13th century into towns of great wealth and im-

portance, having an extensive home and foreign trade, Berwick being described as the greatest seaport in the British island. But with the death of Alexander III., and the outbreak of the War of Succession, all this was changed. Berwick was captured by the English king and sacked; the castles of Jedburgh and Roxburgh were from time to time taken and retaken, being alternately garrisoned and demolished. Of the ancient busy trading town of Roxburgh, not one stone is left upon another; and of its great castle and fortress, but the merest vestiges. Even the splendid religious establishments—the abbeys, churches, and monasteries—did not escape spoliation and destruction, Melrose requiring, after the time of Edward I., to be almost rebuilt. On the English Border, the ruinous effects of these national wars were felt also, though not to the same extent; for in Northumberland was no town to speak of nearer than Newcastle, and the intervening moors and mosses afforded but scant booty to the spoiler. The Scots, therefore, in their reprisals, while not omitting to ravage the nearer dales of the Rede and the Till, were obliged to extend their inroads beyond the high and barren tracts of Northumberland; and it was the richer though more distant valleys of Durham and Yorkshire that heard the fierce war-cry of Randolph and the Douglas, and yielded to the invaders the harvest of the sword. Weardale and Teesdale were better hunting-grounds in which to ‘drive a prey,’ than the upper waters of the Coquet and the Tyne.

It was doubtless due to the exigencies occasioned by these constantly recurring Border wars and raids, from the 13th to the 16th century, that the whole country on both sides of the frontier became so thickly studded with castles and peel-towers, the numerous ruins of which still form a distinctive feature in Border scenery. These castles and towers, generally planted on heights overlooking the river-valleys, stood as a rule within sight one of another, in order that the signals of invasion or alarm might be the more rapidly spread from point to point. From a survey made in 1460, we find that Northumberland alone possessed thirty-seven castles and seventy-eight towers; and the Scottish side was equally well strengthened and defended. Among the larger and more important fortresses on the English side, were the castles of Wark, Norham, Alnwick, Newcastle, Carlisle, Naworth, and Cockermouth; and on the Scottish side, the castles of Berwick, Roxburgh, Jedburgh, Ferniehirst, Cessford, Branxholme, Hermitage, Lochmaben, Caerlaverock, and Threave; besides the hundreds of peel-towers and bastel-houses scattered over the country. On both Borders also grew up many fortified towns, upon whose walls the citizens by turns kept nightly watch and ward.

To narrate all the invasions that took place on either side of the Border would be to repeat great part of the general history of England and Scotland; but as giving some idea of the extraordinary havoc and destruction occasioned by these wars and invasions, two authentic reports may be referred to. In 1544 Sir Ralph Evers and Sir Brian Latoun, with an English army, invaded the Scottish Border, and between July and November they destroyed 192 towns, towers, barmkyns, parish churches, &c.; slew 403 Scots and took 816 prisoners; carried off 10,386 head of cattle, 12,492 sheep, 1296 horses, 200 goats, and 850 bolls of corn, besides an untold quantity of ‘inside gear and plenishing.’ In one village alone—that of Les-sudden (now St Boswells)—Sir Ralph Evers writes that he burned ‘16 strong bastel-houses.’ Again, in September of the following year, the Earl of Hertford a second time invaded the country, and between the 8th and 23d of that month, he ‘razed

and cast down' the abbeyes of Jedburgh, Kelso, Dryburgh, and Melrose, and burned the town of Kelso. At the same time he destroyed about 30 towns, towers, and villages on the Tweed, 36 on the Teviot, 12 on Rule Water, 13 on the Jed, 45 on the Kale, 19 on the Bowmont, 109 in the parishes of Eccles and Duns in Berwickshire, with 20 other towers and villages in the same county. The places destroyed are all named in the report to the English king, along with a classified list of that terrible sixteen days' destruction, embracing 7 monasteries and friars' houses, 16 castles, towers, and peels, 5 market-towns, the immense number of 243 villages, with 13 mills, and 3 'spitals and hospitals.'

The Borders have likewise been the scene of some great historical battles. Of what may be called national contests, in which Scots and English armies were opposed to each other, there is the battle of Halidon Hill (1333), Otterburn (1388), Homildon Hill (1402), Piperden (1435), Flodden (1513), Solway Moss (1542), and Ancrum Moor (1544). In three of these battles—Otterburn, Piperden, and Ancrum Moor—the Scots were victorious. Of what may be called internal contests, we have the fight at Arkinholm, now Langholm (1455), between Scotsmen, when James II. broke the power of the Douglasses; the battles of Hedgeley Moor, near Percy's Cross, and of the Levels, near Hexham (1463), between the English adherents of Lancaster and York, when the Lancastrians were defeated; the skirmish of Haliden, near Melrose (1525), between Scotsmen under Angus and Buccleuch, when Angus vanquished the Border chief; and the battle of Philiphaugh (1645), when Leslie drove Montrose off the field. Of many faction fights and deeds of daring, such as the Raid of the Reidswire (1575) and the rescue of Kinmont Willie from Carlisle Castle (1596), the ancient ballad-writers are the best historians.

In order to provide against the exceptional tendencies of the Borderers on the one side of the frontier to fall out with and plunder those on the other side, the governments of both countries, in the 14th century, divided the frontier into the East, West, and Middle Marches, over each of which divisions wardens were appointed by their respective sovereigns. These wardens were salaried officials, and endowed with great administrative and judicial powers. They stood to their respective districts in the place of the sovereign; and the office was at one time hereditary, being practically vested as the prerogative of a few of the higher nobles who had estates on the Borders. At certain times, a day of truce was held, when the English and Scottish wardens met, examined each other's credentials, and settled any questions that might be in dispute between their followers. As in the case of the Raid of the Reidswire, these meetings did not always end peacefully. (For details as to the duties of the wardens, and the laws and usages of the warden courts, see *The History of Liddesdale and the Debateable Land*, by R. B. Armstrong, part i. 1883.) One district which was the cause of much trouble to the wardens of the West March, was that known as the Debateable Land, which lay partly in England and partly in Scotland. Its south boundary was formed by the Esk, from its junction with the Liddel to where it enters the Solway; and within the Debateable Land were comprehended the baronies of Kirkcandrews and Morton in Cumberland, and Brettaloch or Bryntallone (now Canonbie) in Dumfriesshire. It is first mentioned in a proclamation of 15th November 1449, as 'the lands called Batable or Threep lands.' Its chief families were the Armstrongs and Grahams, both clans being noted as desperate thieves and freebooters.

They had frequently to be dealt with by force of arms, till in the 17th century the Grahams were transported to Ireland, and forbidden to return upon pain of death. Other districts of the Borders from time to time called forth hostile visitations from the Scottish kings or their commissioners, when great numbers of the robbers were frequently seized and hanged. So late as 1606, the Earl of Dunbar executed as many as 140 of them. The union of the crowns removed some obvious grounds of contention between the English and Scottish people, and after the middle of the 17th century the Borders gradually subsided into a more peaceful condition.

The character and habits of the Borderers were much alike both on the English and the Scottish side. While the greater nobles lived in large and strong castles, the inferior gentry occupied the peel-towers, in which the accommodation might barely suffice for the wants of a small farmer of the present day. And yet the accommodation, meagre as our modern ideas would esteem it, was probably sufficient for the simple wants of a rude and hardy people, who must have set but little value upon movable and perishable property, knowing how liable they were to have it stolen or consumed, and how readily, by equally predatory means, they might replace it from the stores of others. The tie or feudal bond, on the Scottish Border at least, between the chiefs and the principal men of their clans, was that implied in the term 'kindly tenant'—i.e. a tenant who was of the kin of the chieftain, or whose family had held their lands in succession, from father to son, for several generations. This tie was not dependent upon payment of rent either in money or in kind, but upon kinship, and was for the binding together of the leading members of the clan in the common objects of self-interest and self-defence. In a society so constituted it was inevitable that there should be much strife and contention, not only between the residents on opposite frontiers, but among the clans themselves, and many instances of cruelty and almost savage vindictiveness have been left on record; yet what to some extent redeemed this state of things from sheer barbarity was the fine and elevating spirit of chivalry. Hence the achievements which have found lasting enshrinement in the Border ballads.

For the early history, see Dr Skene, *Celtic Scotland* (3 vols. 1876-80); Rhys, *Celtic Britain* (now ed. 1908). For later periods: Ridpath, *Border History of England and Scotland* (1776); *History of Northumberland*, by Wallis (2 vols. 1769); by Hodgson (7 vols. 1820-58); F. H. Groome, *Short History of the Borders* (1887); Pease, *Lord Wardens of the Marches* (1913); Graham, *Border at the Union* (2d ed. 1908); Family Histories by Sir William Fraser (q.v.). For general antiquities: Collingwood Bruce, *Roman Wall* (3d ed. 1867); W. Sidney Gibson, *Northumberland Castles, Churches, and Antiquities* (3 series); Scott, *Border Antiquities* (2 vols. 1814-17); Sir T. Dick Lauder, *Scottish Rivers* (1874); the great *History of Northumberland* (1893 et seq.); *Proceedings of Scottish Society of Antiquaries, Archaeologia Æliana* (Newcastle), *Berwickshire Naturalists' Club*, and *Hawick Archaeological Society*. For manners, customs, dress, weapons, superstitions, poetry, dialect, &c.: Scott, *Minstrelsy of the Scottish Border* (3 vols. 1802-3); Veitch, *History and Poetry of the Scottish Border* (1877; new ed. 1893); Henderson, *Folklore of the Northern Counties* (2d ed. 1879). For local history: Tate, *History of Alnwick* (2 vols. 1866); A. Jeffrey, *History and Antiquities of Roxburghshire* (4 vols. 1858-69); Chambers, *History of Peeblesshire* (1864); Craig-Brown, *History of Selkirkshire* (2 vols. 1886); Mrs Oliver, *Upper Teviotdale, and the Scotts of Buccleuch* (1887); Douglas, *Roxburgh, Selkirk, and Peebles Shires* (1898); Borland, *Border Raids and Reivers* (1897); Murray, *Dialect of the Southern Counties of Scotland* (1873). See BALLADS, CASTLE, PEEL-TOWER.

Border States, in America, meant historically the slave-holding states bordering on the southern

free States—Delaware, Maryland, Virginia, Kentucky, and Missouri; but North Carolina, Tennessee, and Arkansas were sometimes included in the designation. Of these Virginia, North Carolina, Tennessee, and Arkansas seceded to the confederacy. The 'Border war' in Kansas between the pro-slavery 'sons of the south' (also uncomplimentarily called 'Border ruffians'), from Missouri and elsewhere, and the 'Free State men' from the north, began in 1854, and continued for several years; as is explained at KANSAS.

Border-warrant, an obsolete form of diligence used in the Border counties of Scotland for detaining the person of an English debtor. It was more rigorous than the general *meditatio fugae* warrant. See DEBT, MEDITATIO FUGAE.

Bordighera, a winter-resort in the Riviera, north Italy, on a hill overlooking the Mediterranean, 7 miles WSW. of San Remo by rail. It was founded in 1470, but its modern progress dates from the opening of the Cornice road in 1823, and of railway communication. The place, which is noted for its palm gardens, suffered severely from the earthquake of 1887. Resident population, 5000. See the *Westminster Review*, vol. cliv. (1900).

Bordone, PARIS, a painter of the Venetian school, was born of noble parentage at Treviso in 1500. He studied under Titian, to whom his works are often attributed, and under Giorgione. He worked in his native town, in Vicenza, and in Venice. In 1538 he was invited to France by Francis I., who employed him to paint portraits of himself and of leading members of his court. He was knighted by Francis II. At Augsburg he painted in the Fugger Palace, and at Milan in the chapel of St Jerome; and he died at Venice in 1570. His most important monumental work in painting was the six sacred subjects with which he decorated the dome of San Vincenzo, Treviso; and his 'Fisherman presenting the Ring of St Mark to the Doge,' now in the Academy, Venice, is ranked as masterpiece among his easel pictures. See Kugler's *Schools of Painting in Italy* (1881) and the new edition of Crowe and Cavalcaselle.

Bordure, a border surrounding a shield, generally said to occupy one-fifth of the field. Sometimes an independent bearing, it is often a difference of a cadet. It may be engrailed, invected, wavy, &c., parted in many ways, or charged. A *bordure compony* or *gobonated*—i.e. divided into sixteen squares—is often an indication of illegitimacy; and in later times a *bordure wavy* has been used in England (not Scotland) with the same significance. See HERALDRY.

Bore, a tidal phenomenon at the estuaries of certain rivers, also called *Eagre*. The first name may be derived from the Old Norse *bára*, a wave; the second, obviously the same as William of Malmesbury's *higre*, is erroneously referred to *ægir*, a sea-god. When a river expands gradually towards a very wide mouth, and is subject to high tides, the spring flood-tide drives an immense volume of water from the sea into the river; the water accumulates in the estuary more rapidly than it can flow up into the river; and thus there is gradually formed a kind of watery ridge stretching across the estuary, and rushing up towards the river with great violence and much noise. In some cases this ridge or bore is many feet in height. This phenomenon is observable in several British rivers, as the Severn, Trent, Wye, and Solway. The most celebrated bores are those of the Ganges, Brahmaputra, and Indus: in the Hugli branch of the Ganges the bore travels 70 miles in four hours, and often appears suddenly as a liquid wall over 7 feet high. That at Hang-chow-fu is very dangerous; and the Bay of Fundy is remarkable for

its tidal phenomena. See TIDE; and for a detailed description of the phenomenon with illustrations, see F. M. Burton's *The Shaping of Lindsey by the Trent* (1907).

Bore is the internal cavity of any kind of firearm. It is in most cases cylindrical; but in the Lancaster gun it was oval, and in the Whitworth hexagonal, both being also spiral; while in all rifled firearms it is furrowed with spiral grooves, and for the same reason—viz. to give that rotation which enables an elongated projectile to be used (see RIFLE). In most modern guns and small arms there is a chamber at the bottom of the bore. In breech-loading weapons this chamber is larger in diameter than the bore, in order that the cartridge and projectile may enter it easily. In muzzle-loaders it is generally of smaller diameter, but an enlarged chamber has been tried in some heavy guns in order to give more air-space for the expansion of the gases when the cartridge is fired. The diameter of the bore is called the 'calibre.' In rifled guns it is measured not from the bottom of the grooves, but from the smooth surfaces between them, called the 'lands.' Heavy iron guns were formerly cast solid and then bored out, but, as it is essential that the surface of the bore should be extremely hard to prevent its being 'scored' by the shot, endeavours were made in America to attain this object by casting them hollow, and cooling the inner surface more rapidly than the rest of the metal. But see CANNON.

Boreas, the Greek name of the north-east wind, blowing towards Hellas from the Thracian mountains, and personified in mythology as the son of Astræus and of Eos or Aurora, and as brother of Notus, Zephyrus, and Hesperus. He was said to dwell in a cave of the Thracian Hæmus. He had a temple in Athens, because he destroyed the Persian fleet of Xerxes; and at Megalopolis a yearly festival was celebrated in honour of his aid against the Spartans.

Borecole. See KALE.

Bore-holes in the crust of the earth are made for purposes of Blasting (q.v.) and Mining (q.v.); for obtaining water, salt, petroleum, or natural gas; for gaining information useful to the geologist or the engineer as to the nature and condition of rocks below the surface. They are used also as sources of power, as in Italy, where they discharge high-pressure steam, utilised by turbines. Since 1904 Sir Charles Parsons has advocated the sinking of a shaft to 12 miles in a region to be selected by geologists. He estimated that it might be completed in about eighty-five years, at a cost of £5,000,000. Of existing bores, that of Paruschowitz (6572 feet), once the deepest, has been surpassed by Czuchow (7350 feet), also in Silesia. For methods, see BORING.

Borelli, GIOVANNI ALFONSO, a distinguished mathematician and astronomer, and the founder of the iatro-mathematical school, born at Naples 28th January 1608, was educated at Florence, and became professor of Mathematics at Pisa, and of Medicine at Florence. Having taken part in a revolt, he was obliged to leave Messina, and spent the remainder of his life at Rome, where he died 31st December 1679. He carefully observed the motions of the satellites of Jupiter, then little known, and was one of the first to recognise the parabolic paths of comets. He wrote a treatise on fevers, and a number of works on subjects of applied mathematics, of which the most celebrated is that *De Motu Animalium* (Rome, 1680–81). In this work he applies the laws of mechanics to the motions of animals.

Borers, a name applicable to many beetle-like or Coleopterous insects in the family of wood-eaters

or *Xylophaga*, but peculiarly applicable to the genera *Ptinus* and *Anobium*. The larvæ eat their way through wood, and when that happens to be furniture, the species of *Ptinus*, &c. come to have some practical human interest. They are mostly inconspicuous animals, resting during the day in the larval tunnels, active and roving at night. *Ptinus fur* is common all the world over, and both as adult and larva much too common in the experience of herbarium keepers, insect collectors, owners of stuffed birds, not to mention wearers of furs, and housewives generally. They are most readily got rid of by the lure of a damp cloth or by vegetable matter left in the room over night, and destroyed with its attracted victims in the morning. The larva of *Anobium striatum* does great damage to furniture made of soft wood. Its little round tunnels, looking as if made by a drill, and full of the finest powder formed from the devoured wood, are familiar enough.



Borer (*Anobium striatum*):
Natural size, and magnified.

The larva rests after a while, spins a silken cocoon, sleeps and grows for a time at the bottom of its hole, and finally emerges a miniature beetle, a dark-brown insect, with a proportionately large thorax overlapping the head, but not measuring in all much above a line in length. Like its relatives in this family, it pertinaciously feigns death when touched or alarmed, an instinct probably at first due to a pathological panic and paralysis, but now normal, habitual, and doubtless of advantage. Other species (*A. tessellatum* and *A. pertinax*), also found in furniture, but likewise, as is indeed usual, on trees, have in their adult stage some importance in the history of superstition as insects which produce a knocking noise, regarded as a presage of the approach of death. The adult is wont to knock against the wood with his upper jaws, but these 'blows, which are taken for the knocking of Death himself, are nothing but a knocking of the male at the door of his loved mate.' The larvæ should be smothered. There are many other genera of borers, *Lyneceylon navale* on ship-timber, *Ptilinus* on books, *Apate* on oak furniture, and so on; but the point of interest is the general habit of the family. See DEATH-WATCH, also BORING-ANIMALS.

Borgerhout, a suburb of Antwerp, on the Schyn, with manufactures of tapestry and tobacco, and dye and bleaching works, and a monument of Carnot, who defended it. Pop. 55,000.

Borghe'se, a family of great distinction in the republic of Siena, and afterwards at Rome. One of the family, CAMILLO BORGHESE, ascended the papal throne in 1605 as Paul V., and by him other members of the family were advanced to high positions. A marriage with the heiress of the house of Aldobrandini brought the Borghe'se family into the possession of great wealth.—CAMILLO FILIPPO LUDOVICO BORGHESE, Prince Borghe'se, born at Rome in 1775, joined the French army, and in 1803 married Pauline, the sister of Napoleon Bonaparte, and widow of General Leclerc. Under the French empire he was for some time governor-general of the provinces beyond the Alps, and held his court at Turin. He sold the Borghe'se collection of artistic treasures to Napoleon for 13,000,000 francs, receiving in part-payment the Piedmontese national domains; but

when these were reclaimed by the king of Sardinia in 1815, he received back some of the works of ancient art. After the overthrow of Napoleon he separated from his wife, and broke off all connection with the Bonaparte family. He lost Guastalla, which he had received through his wife, but retained the principalities of Sulmona and Rossano, his hereditary possessions. He died in 1832.—The Borghe'se Palace, bought by the Italian government in 1902, is one of the most magnificent at Rome, and its collection of paintings is remarkably fine.

Borghesi, BARTOLOMMEO, COUNT, a distinguished Italian antiquary, born at Savignano, in 1781. At Bologna and Rome he devoted himself to archaeological researches. He next arranged and catalogued various collections of coins, including that of the Vatican. In 1821 he fixed his residence in the little republic of San Marino, where he lived devoted entirely to study, and died 16th April 1860. Borghesi did enormous service to Roman epigraphy and numismatics. See his complete works, published at the expense of the French government by the Academy of Inscriptions at Paris (vols. i.-ix. 1862-79).

Borgia, a family originally of Jativa, in the Spanish province of Valencia, where, at the time of the expulsion of the Moors (1238), the name figures among the *Caballeros de la Conquista*. One of its members, Alfonso de Borja (1378-1458), bishop, and private secretary to Alfonso of Aragon, accompanied that monarch to Naples, where he had gone to establish his rule. This Borja, chosen pope as Calixtus III., settled a number of his family in Italy. Rodrigo de Borja (1431-1503), his nephew, in turn ascended the papal throne in 1492, under the title of Alexander VI. (q.v.); and from that time the principal seat of the family was in Italy, while its name took the Italian form of Borgia. Before his elevation to the pontificate Alexander had had a number of children by a Roman girl, known in history as Vanozza, but whose real name was Giovanna Catanei (1442-1518). Two of these children, Cæsar, the fourth, and Lucrezia, Duchess of Ferrara, the fifth, were destined to play important parts, and to acquire in history an unhappy renown.—CÆSAR BORGIA was born in April 1476, and died in 1507. An ambition that knew no bounds, energy that never flagged, and a contempt for laws divine and human, joined to qualities of the first order as a general and administrator, rendered him one of the most extraordinary figures of the Renaissance period. To arrest his vast projects, there was required a league of all Italy and of the most powerful sovereigns of Europe. Vowed to the priesthood from his birth, and from the age of seventeen invested with the dignity of cardinal, he early resolved to surmount all obstacles to his ambition; he shrank from neither sacrilege nor murder, and procured the assassination of his elder brother, Giovanni, Duke of Gandia, whom he shortly after succeeded in the post of captain-general of the Church, for which he readily doffed the purple to assume the breastplate. His father, Alexander, had made an alliance with Louis XII. of France for the invasion of the kingdom of Naples. In the Princess Charlotte d'Albret, sister of the king of Navarre, a bride had been found for Cæsar, who, named Duke of Valentinois, with a rich pension and the promise of a company of two hundred lances for the support of the throne of St Peter, went to contract his marriage (11th May 1499) in France, and carried in exchange to Louis the papal bull, which was indispensable to the king before he could espouse his predecessor's widow, Anne of Brittany. Cæsar's active life extended over no more than four years. Whilst his father

was crushing the feudal power of the barons of the Romagna, he undertook to recover, one by one, all the fiefs along the Adriatic coast which had ceased to acknowledge the over-lordship of the Holy See. In two successive campaigns, he made himself master of the Romagna, Perugia, Siena, Piombino, the duchy of Urbino; he went so far as to threaten Florence itself, and was planning the reconstruction of a kingdom of Central Italy, with himself at its head, when a powerful league was formed against him. His own officers sought to arrest his march, but he misled them by a feint, divided them, invited them to Sinigallia, and there coldly passed on them sentence of death. Named Duke of Romagna by the pope, he was proceeding to menace Bologna and expel the family of Bentivoglio, when, on the eve of his departure for his third campaign, both he and his father were stricken with sudden illness while at a farewell banquet given by the Cardinal of Corneto. There was talk of poison. The old man succumbed (August 18, 1503), but Caesar's youth, and his extraordinary force of will, triumphed over the malady; the death of Alexander, however, was in effect the end of his projects, and his enemies now raised their heads. The election of Pius III. (a Piccolomini) gave him a moment's hope; the succession of Julius II. (Della Rovere), his bitterest enemy, after Pius's brief reign of twenty-seven days, was fatal to him. Caesar surrendered at Naples, under the promise of a safe conduct from the king of Aragon; but Gonsalvo de Cordova broke his oath, and (25th May 1504) had him arrested and carried to Valencia. After an attempt to break out of Chinchilla, where he was first imprisoned, he was removed to Medina del Campo, from whence, on the 25th October 1506, he made his escape to the court of Navarre. Here he took command of the royal forces against Luis de Beaumont, Constable of Navarre, who refused to surrender the citadel of Viana, which he held for the king; and in a sortie, 12th May 1507, at the age of thirty, Caesar Borgia fell, after heroically defending himself, at a place called Mendavia. Despite attempts to rehabilitate it, his memory remains in execration—despite, too, the estimate of Machiavelli, who had him in view when he wrote the *Principe*; he has moreover left among the peoples whom he governed, the reputation of a just prince, upright and severe, and of an able administrator. He encouraged art, and was the friend of Pinturicchio, and the protector of Leonardo da Vinci.—**LUCREZIA BORGIA**, born at Rome in 1480, married in the first instance Giovanni Sforza, Lord of Pesaro (June 1493); but her father, ambitious of a more advantageous alliance, annulled this marriage (20th December 1497), and gave her (20th June 1498) to Alfonso, Duke of Bisceglia, nephew of the king of Naples. The same motive induced her father and brother to separate her from her new husband, who was assassinated, 18th August 1500, by Michelotto, Caesar Borgia's bravo. For the third time free, the pope's daughter became, in spite of the repugnance of the Duke Ercole d'Este, the wife of the latter's son, Alfonso, who soon after inherited the duchy of Ferrara. Lucrezia has been represented as placed outside the pale of humanity by her wantonness, her vices, and her crimes; but the recent researches of most accurate and unprejudiced historians have demonstrated that in her youth, with no initiative, no choice permitted to her, she was rather the too pliant instrument in the hands of Alexander and of Caesar Borgia. She died 24th June 1519, enjoying the respect of her subjects, a generous patroness of learning and of art.

See **POPES**, and Creighton and Pastor on the popes; and books by A. H. Matthew (1912), Leslie Garner (1912), Woodward (1913), Sabatini (1914); on Lucrezia, works

by Gilbert (1869), Yriarte (1888), and Gregorovius (trans. 1904).

Borgo, a name given to a number of towns and villages in Italy, indicating growth around a castle or castellated rock, the original Borgo (a word of Germanic origin; see **BOROUGH**). Thus there are the *Borgo*, the north part of Rome, on the right bank of the Tiber; *Borgo-Manero*, 20 miles NNW. of Novara; *Borgo San Donnino*, in the province of Parma, &c.

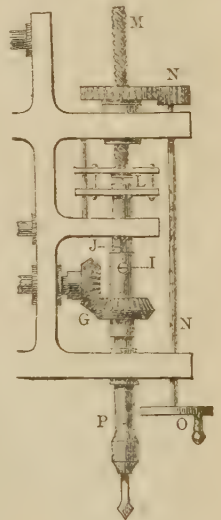
Borgognone, **AMBROGIO**, a Milanese painter, whose real name was Ambrogio Stefani de Fossano. The assertion that he designed the facade of the Certosa of Pavia in 1473 is very doubtful; but he is known to have been working upon frescoes there in 1490, and the series, in which he was aided by his brother, Bernardino, is so extensive that it must have occupied many years. He returned to Milan in 1494; painted the tribune of the Incoronata, Lodi, 1497; and in 1508 produced an altarpiece, still in San Spirito, Bergamo. His latest undoubted work was a 'Coronation of the Virgin,' in San Simpliciano, Milan, 1524. His devotional subjects are characterised by a gentleness and a measured calm; but in treating dramatic incident he is frequently forced and exaggerated.

Borgu, or **BUSSANGA**, an African state, of which the eastern part falls within Nigeria, the western part being in Dahomey, lies to the west of the Niger (q.v.), and borders on Gando and Illorin, provinces of Sokoto (q.v.). The country is very fertile and thickly populated. It was at Boussa (or Bussang) on the Niger, one of the chief towns, that Mungo Park lost his life in 1805; Nikki, to the west, is in French territory.

Boric Acid. See **BORACIC ACID**.

Boring is variously performed according to the medium dealt with. For making small holes in soft woods and like substances, awls are employed, which merely cut and displace a portion of the yielding material. In boring hard woods and large holes, carpenters use gimlets, augers, and the brace and bits, which all cut and scoop out the material. In the jewelry and small metal industries, hand-drills, which consist of a spindle with steel bits, to which reciprocating rotation is given, are the implements for piercing small holes. The boring of holes in metal plates is effected by means of *drills* driven by machinery. The annexed figure shows the essential parts of such a boring machine. The drill is inserted in the end of a vertical spindle, P, which revolves in a fixed frame, and is driven by the bevel-wheels, G. The metal to be bored is placed on a table or other support below the drill; and the up-and-down motion, or end-pressure and off-action, of the drill is effected by the hand-gear, O, N, turning the screw, M; which being coupled to the top of the spindle at L, presses it down or raises it, according to the way it is turned. The spindle slides vertically in the collar forming the axis of the bevel-wheel, but is carried round with it by means of the pin, I, which projects into a groove seen at J.

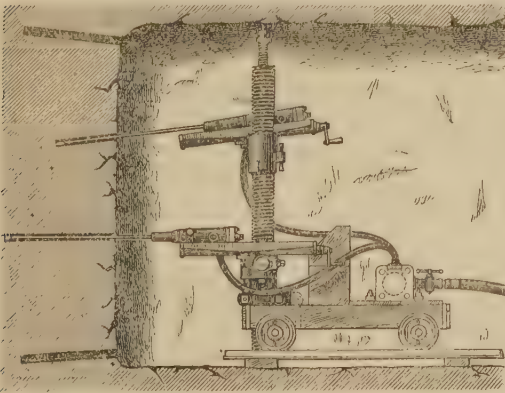
The boring of cannon and of cylinders for steam-engines, and for the propeller shafts of



Boring Machine.

steamers, is most conveniently dealt with under BORE and CANNON; see also LATHE.

As applied to the earth and to rocks, boring embraces two classes of operations—boring of shot-holes for Blasting (q.v.), and the sinking of bores in prospecting for minerals, and in forming wells for water, salt-brine, and mineral oils. Blast-holes in rocks are made from 1 to 2—sometimes more—inches in diameter, and may pierce to the depth of 9 feet. Such holes are most simply made in hard rock by a steel-pointed drill, struck by a hammer, and turned partly round after each blow to make the hole cylindrical. The addition of a little water serves to preserve the temper of the boring tool, and makes the rock more easy to cut. In soft rock, whenever the hole is to be vertical, a 'jumper' is used. This is a weighted drill, which acts merely by its own weight when let fall from about a foot in height. The powdered stone is removed at intervals by a 'scraper.' But in all great engineering undertakings rock-boring machinery now supplants hand work. The machines are principally devised to imitate the percussive action of the hand-drill, the boring chisel being worked and rotated by compressed air, and sometimes directly by steam. The compressed-air machines possess the great advantage of aiding in the ventilation of the working—often a most important consideration, seeing the operations are chiefly carried on in confined spaces where vast volumes of poisonous gases are evolved from explosions. The earliest practical rock-boring machine was that of Sommeiller, one of the engineers of Mont Cenis Tunnel, at which undertaking the apparatus was first used. Now the forms of percussion machines are very numerous, improvements being directed towards lightness and simplicity of parts, and to the method—automatic or otherwise—of advancing the boring tool as the work proceeds. Well-known machines are the



Darlington Rock-boring Machine.

Barrow, Burleigh, Darlington, Ferroux, Ingersoll, Champion, and McKean rock-borers. Diamond-drills working in the manner described below are also used. Brandt's rotatory borer is an apparatus similar in action to the diamond-drill, but with a crown of hardened steel in place of cutting diamonds. The tool is pressed against, and rotated by water-power. An apparatus similar in principle to the brace and bits of the carpenter is used with advantage in uniform rock such as slate.

The bores for deep wells of all kinds, and for discovering the mineral contents of a region, come under one category. As a preliminary operation in mining, boring is of the utmost importance for discovering the position, thickness, and dip of mineral strata or lodes, and for ascertaining the nature of the overlying deposits. Bores are made by three

classes of implement—(1) boring-rods, (2) rope-borers, and (3) diamond-drills.

The rod boring instrument consists of an iron shank, having a cross-bar at the top and a hollow screw at the bottom; to this all the successive boring instruments are fastened. A simple chisel is first attached to the screw, and one or two men press upon the cross-bar, and at the same time force it round like an auger; while another workman, by means of a lever erected overhead, with a chain descending from it to the cross-bar, gives an up-and-down motion to the instrument. When the chisel becomes clogged, from the accumulation of material which it has loosened, it is exchanged for a cylindrical auger, provided with a valve, which scoops out the separated material; and thus by alternate chopping and scooping the work is carried on. The nature of the strata is determined with considerable facility and certainty by examining the fragments brought up by the auger. As the work advances, successive lengths of rod are screwed on at the upper end. A derrick pole is erected over the bore-hole for the purpose of elevating the rods, to permit the change of the tools.

The rope method of boring has been long in use among the Chinese. By it the great loss of time, arising from the screwing and unscrewing the rods, at each elevation of the chisel or auger, is saved. The chisel and scooping instrument are fastened to a rope, which is alternately elevated and allowed to descend by the simple force of gravity; the instrument thus forces its way through the ground. In the softer rocks of the newer formations this method has been successfully employed in boring for artesian wells. The rope-boring machinery of Mather and Platt of Salford, in which a flat hempen rope is employed, is in extensive use.

For deep well-sinking, as in the Pennsylvanian oil region where depths of 3000 feet and more have to be reached, and for mineral prospecting, the diamond-drill in modern times largely superseded all other borers. With this apparatus the earth can be pierced at any angle, which is a great advantage in investigating mineral deposits; and moreover, the drill produces solid and continuous cores of the strata through which it passes, so that a complete section of any bore can be exposed to view. The diamond-drill consists of a 'crown,' or cylinder of steel, around one edge of which are fixed a series of black diamonds. These diamonds are so set that they project alternately a little beyond the outside and inside edge of the cylinder. This crown is screwed to lengths of iron tubing as it cuts its way by rotation into the rock, and it makes as it descends an annular cutting somewhat bigger than the thickness of the continuous tube, which the crown and its shaft form. Thus a core of rock is cut out and held within the tube, and the pieces may be lifted out from time to time as the work proceeds. The detritus resulting from the abrasion of the ring of rock is continuously washed away by a current of water forced down within the tubing. Diamond-drills are made of many sizes, from $1\frac{1}{4}$ up to 18 inches diameter. The prototype was M. Fauvelle's hollow boring-rod with steel crown described at the British Association meeting in 1846. See BORE-HOLES.

Boring-animals. While individual boring-animals are noticed under many separate articles (e.g. BARK-BEETLE, BEE, BIVALVES, BORERS, CATERPILLAR, TEREDO, &c.), it may be convenient to indicate the widespread nature of the habit. Every one is familiar with the appearance of an oyster-shell on the shore riddled with small holes. This is the work of a small sponge, *Cliona* or *Vioa*, one of which inhabits each hole. Other Clionids exhibit a similar power, but how the

boring is effected is not known. The action is probably both chemical by means of secretion, and mechanical by means of spicules. Many worms not only bore in the sand and soil, but into soft organisms like sponges, or among corals and the like. Some sea-urchins, being well equipped with a protruding masticatory apparatus, seem to bore or at least to improve holes for themselves. The Crustaceans can hardly be said to bore, though they burrow very considerably, as in the case of the common crayfish. One of the Isopods, however, *Limnoria terebrans*, devours the wood of harbour piles and the like, and does no little damage to such structures on northern coasts. Many insects are consummate borers both in their adult and in their larval stages. The work of the Bark-beetles (q.v.) and Borers (q.v.), and of the Carpenter Bee (q.v.), are good illustrations of this activity. The name bore-fly is sometimes applied to the large genus of Dipterous insects (*Trypeta*) whose larvæ do great damage to many plants. The most important borers, however, are the molluscs, especially such bivalves as *Pholas* (q.v.), *Xylophaga*, and *Teredo*. These belong to the large family *Pholadidæ*, which includes some four-score species, all more or less efficient borers in wood or soft stone. Of these the Ship-worm, *Teredo* (q.v.) is probably the most formidable. A closely allied family of *Gastrochaenidæ* is characterised by the same habit; *Gastrochaena*, *Clavagella*, and *Aspergillum* (q.v.) are the most important genera. A common bivalve on most coasts, *Saxicava*, is usually credited with considerable boring powers, but it seems probable that its activity has been overrated, and that it utilises old holes to a large extent. *Lithodomus*, belonging to the edible mussel family, is a powerful borer, and has left its marks on the well-known pillars of the Serapis temple near Naples. Many Gastropods, too, bore with their odontophores into the shells of other molluscs, into coral stocks, and the like; and any one who likes to confine snails in a paste-board box will soon have evidence of the rapidity of their boring powers. There is considerable divergence of opinion as to the exact way in which bivalve molluscs bore, but there can be little doubt that the foot rather than the shell is the chief agent.

Borissov, a town in White Russia, on the Beresina, 418 miles WSW. of Moscow by rail; pop. 20,000.

Borkum, one of the East Frisian Islands, at the mouth of the Ems, 25 miles NW. of Emden; pop. 3000, increased in the summer by over 20,000 visitors.

Borlase, WILLIAM, antiquary, was born at Pendeen, Cornwall, February 2, 1695. Educated at Tiverton and Exeter College, Oxford, he was presented in 1722 to the living of Ludgvan, near Penzance, and to the vicarage of his native parish of St Just in 1732. He devoted himself to a study of the natural history and antiquities of Cornwall, and in 1754 published his *Observations on the Antiquities of Cornwall*. His account of the Scilly Isles three years later drew from Dr Johnson the praise of being 'one of the most pleasing and elegant pieces of local inquiry that our country has produced.' His *Natural History of Cornwall* appeared in 1758. Soon after he presented his entire collections to the Ashmolean Museum. He had already been elected a Fellow of the Royal Society in 1750, and in 1766 his university gave him the diploma of Doctor of Laws. Borlase was one of Pope's correspondents, and furnished the poet with most of the curious fossils of which the Twickenham grotto was composed. He died August 31, 1772.

Bormio, an Italian town, with hot sulphur-baths, 4020 feet above the sea, in the Alpine province of Sondrio, and in the Upper Adda valley, on the road to the Stelvio pass; pop. 2000.

Born, BERTRAND DE, a famous troubadour, born about 1140 in Périgord, who played a conspicuous part in the struggles of the English king Henry II. and his sons, and died before 1215. More than forty of his poems are extant, among them both glowing love-poems and strong and sarcastic satires. See *PROVENÇAL*; editions by Stimming (1879) and Thomas (1881), and Hewlett's *Richard Yea-and-Nay* (1900).

Born, IGNAZ (1742-91), mineralogist, born at Karlsburg in Transylvania, was trained as a lawyer, but devoted himself to mineralogy. He wrote several works, and introduced valuable new processes in mining, bleaching, and salt-working.

Borna, a town of Saxony, on the Wyhra, 17 miles SSE. of Leipzig by rail; pop. 10,000.

Börne, LUDWIG, a noted German writer, was born 18th May 1786 at Frankfort, where his father, Jakob Baruch, was a Jewish money-changer. He first studied medicine at Berlin under the guidance of the Jewish physician Marcus Herz, to whose wife he addressed the letters published in 1861. From 1807 he studied law and political economy at Heidelberg and Giessen, and in 1809 he returned to Frankfort, where he was for two years (1811 to 1813) registrar of the police board. After this he devoted himself wholly to politics, and in 1818 he had himself baptised, changing his name from Löb Baruch to Ludwig Börne. In various journals started or edited by him (1812-21), he established his reputation as a vigorous opponent of the government. The French Revolution of July 1830 drew him to Paris, where he finally settled in 1832, and died of consumption 12th February 1837. His disappointment with the results of the Revolution drove him from the Liberal to the Radical camp. His views are fully developed in his *Briefe aus Paris* and *Neue Briefe aus Paris* (1832-38), which, while reproaching the German people with every kind of vice and folly, labour to incite the nation to revolution. He and Heine became bitterly hostile to each other; it was the mutual antipathy of a practical enthusiast and an æsthetic indifferentist. Börne's bright and polished style was for many years the favourite model of German journalists; his strength lay in witty satire, but the restlessness of his mind made all his work fragmentary.

The first edition of Börne's *Gesammelte Schriften* (1829-31) was followed by others more complete in 1862-63, 1868, and 1899. In 1840 his biography was published by Gutzkow, and Heine gave vent to his hatred in *Heine über Börne*. See Gervinus, *Ueber Börne's Briefe* (1838); Lives by Beumann (1841) and Holzmann (1888); and Brandes, *Das Junge Deutschland* (1899).

Borneo, next to Australia and Papua the largest island in the world, is situated in the Indian Archipelago, in 7° 3' N.—4° 10' S. lat., and 108° 53'—119° 22' E. long. It is bounded on the E. by the Sea of Celebes and the Macassar Strait, S. by the Sea of Java, W. and N. by the Gulf of Siam and the China Sea. Its length is about 800 miles, with a breadth of 700, and an area of about 284,000 sq. m. The population is roughly estimated at 2,000,000, but may be more. The coasts, which are often low and marshy, and rendered dangerous to navigation by numerous islets and rocks, present no deep indentations, though they are pierced by numerous small bays and creeks. A great part of the island must be described as mountainous; but the relations of the various ranges and groupings are still very imperfectly known, and in very few cases has the

altitude of the leading summits been accurately ascertained. In the far north rises the magnificent structure of Kinabalu (13,698 feet high), built up of porphyritic granite and igneous rocks—the culminating peak probably of the whole Indian Archipelago, and not unworthy in its picturesqueness of such a rank. Throughout the narrow northern portion of the island there runs a kind of central ridge in a general south-west direction, with highest points ranging from 4000 to 8000 feet; and this can be traced, at least as a water-parting, far to the south-west; though broadly speaking, the whole southward country is corrugated and crinkled, as it were, in a most irregular manner. This is the



result of the great process of denudation carried on by the tropical rains, which, scooping out the interior valleys and plains, have laid down the vast alluvial tracts that extend seawards into deltaic morasses. As far as is yet known, the mountain framework of the whole island consists, like Kinabalu, of eruptive and crystalline rocks of high antiquity. Of modern volcanic activity, so prevalent elsewhere in the Indian Archipelago, there is in Borneo no trace either in tradition or in the record of the rocks. A large proportion of the surface, not covered by alluvium, consists of tertiary deposits, in regard to the age of which, however, geologists are not agreed. Pages might be filled with the mere nomenclature of the rivers of Borneo; the more important may be seen on the accompanying map. Though many are powerful streams, navigable far inland for boats of considerable burden, their value as waterways is lessened by the bars which usually prevent the entrance of sea-going vessels, and in their upper reaches by frequent rapids and occasional waterfalls. In connection with the river-systems there are numerous lakes in Borneo; but of true mountain-lakes on a large scale there are probably few. The great lake of Kinabalu, which figured in older accounts with 100 miles of circumference, is a pure myth, based perhaps on a misunderstood description of the great grass-covered plain of Danao.

The climate in the low grounds is humid, hot, and unhealthy for Europeans; but in the higher parts towards the north the temperature is generally moderate, the thermometer at noon varying from 81° to 91° F. During the rainy season, from November to May, heavy storms of wind with loud thunder are experienced on the west coast. The influence of the land and sea breezes passes inland

to quite remarkable distances across the level plains and up the river-valleys. Vegetation is extremely luxuriant. The forests produce iron-wood, bilian, teak, ebony, sandal-wood, gutta-percha, dye-woods, benzoin, wax, dragon's blood, sago, various resins, vegetable oils, and gums. The camphor of Brunei is the best in Asia. The mohor tree, well adapted for making native boats, attains a height of 80, and the kaladang, suited for large masts, of 200 feet. Nutmegs, cloves, cinnamon, pepper, betel, ginger, rice, millet, sweet potatoes, yams, cotton in Amuntai, sugar-cane indigo, tobacco, coffee, pine-apples, coconuts, &c. are cultivated. The mountains and forests contain many monkeys, among which is the orang-utan. Tapirs, a small kind of tiger, small Malay bears, swine, wild oxen or banteng, and various kinds of deer abound. The elephant is only found in the north, and the rhinoceros in the north-west. The few domesticated animals are buffaloes, sheep, goats, dogs, and cats. A few horses are seen in Banjarmasin. Among the birds are eagles, vultures, Argus-pheasants, peacocks, flamingos, pigeons, parrots, and the swifts (*Collocalia esculenta*) which construct the edible nests prized by the Chinese for making soup. The rivers, lakes, and lagoons swarm with crocodiles, and many kinds of snakes, frogs, lizards, and leeches. Fish is plentiful, and the coasts are rich in tortoises, pearl-mussels, oysters, and trepang. Brilliant butterflies and moths are in great variety. Among the mineral products are coal, gold, and copper, especially in Montrado; antimony, iron, tin, platinum, nickel, diamonds and other precious stones, rock-crystals, porcelain-clay, petroleum, and sulphur. The diamond mines are chiefly in Landak and Pontianak (q.v.); Sambas produces the greatest quantity of gold; the kingdom of Brunei, Kutei, and Banjarmasin the largest amount of coal. The Pengaron coalfield, worked by the Dutch government, is one of the most important.

Till of late the population was comprehensively divided into three classes: Dayaks or Dyaks (q.v.), including practically all the 'aboriginal' tribes constituting the bulk of the population, especially in the interior; the 'Malays,' including the true Malays (q.v.) with all Mohammedans, whether of Javanese, Arab, or aboriginal blood; and the Chinese, engaged mainly in trading and mining. Now some authorities distinguish six (or more) distinct pagan races. Hose and MacDougall hold that (as there are no Negritos now in the island) the oldest inhabitants are Indonesians, the nomad hunters of the interior, a timid race of slight build, pale-yellow complexion, and Caucasian features. Next above these in culture are Klemantans and Kenyahs. The Kayans, comparatively late comers from the mainland of Asia, landing in South Borneo, pushed up the rivers across the central watershed, and gave the earlier tribes their culture, notably in rice-planting, iron-working, and religion. The Kayans, 'Proto-Caucasic,' may be akin to the Karens and Chins of Burma. The Muruts and Ibans (Sea-Dayaks) are alien immigrants of much later date.

The women of Borneo, except the Dayaks, weave cotton fabrics, make earthenware, baskets, and mats of beautiful designs and colours. In the district of Banjarmasin are factories of weapons. The principal exports are gold, gold-dust, diamonds, coal, sago, pepper, jelutong, cutch, mineral oil, tallow-nuts, fish, tobacco, ratans, gutta-percha, edible nests, cotton, wax, timber, dye-woods, mats, resins, sandal-wood, camphor.

Borneo has never formed a political unity, and there is no native designation for the island as a whole. The name Borneo (Burnei or Brunei) in fact properly applies only to the Malay kingdom

on the north-west coast; and Kalamantan or Kalamantin, sometimes quoted as a general appellation, is also of limited purport. The following are the present political divisions:

(1) *Brunei*.—This originally included nearly the whole of the north-west of the island. The sultan in 1847 undertook not to surrender any of his territory to any other power without British sanction; in 1888 it was placed under British protection; and in 1906 its administration was given to a British resident. The capital, Brunei, 20 miles from the coast, on the river of the same name, has 10,000 inhabitants. The population of the country is about 25,000. Its area (now 4000 sq. m.) was reduced by the erection of Sarawak into a practically independent principality by Sir James Brooke (1841–68), by the establishment of the British North Borneo Company as a recognised governing body, and by subsequent transference of territory to both neighbours.

(2) *Sarawak* (q.v.), since 1888 also under British protection, but only in respect of foreign affairs and the succession. Area, 42,000 sq. m.; pop. about 600,000; capital, Kuching.

(3) *North Borneo*, under the British North Borneo Company. The company's charter, granted in 1881, transferred to it rights originally obtained by an American adventurer in 1865. This territory consists partly of a portion of the old kingdom of Brunei, partly also of districts on the east coast, claimed by the sultan of the Sulu Islands. Against the British occupation of the Sulu territory a protest was made by Spain, which had for some time been gradually incorporating the sultan's possessions. As a matter of fact, the British North Borneo Company has been successful in appropriating and developing its territory, which, with an area of 31,000 sq. m., and a coast-line of 900 miles, is now divided into five residencies, subdivided into districts, and has its capital at Sandakan or Elopura, the largest settlement, with 8000 inhabitants. Jesselton, on the west coast, is the chief port. The population of the territory is about 200,000. Its political status is similar to that of Sarawak, except that a trading company takes the place of a hereditary raja.

(4) *Dutch Possessions*.—By far the largest part of the island is ruled directly or indirectly by the Dutch, who have divided it into the Residency of the Western Division of Borneo, and that of the Southern and Eastern, the former having Pontianak (q.v.) as the seat of government, the latter Banjarmasin (q.v.). Besides a number of smaller dependencies, the Western Division contains the kingdom of Landak, Tayan, Mampawa, Sukadana, Simpang, Matan, Sekadow, Sintang, Sambas. Among the separate states which go to form the Southern and Eastern Division are Kotaringin, Banjarmasin, and Martapura. Certain districts of the interior are reserved for natives only, Chinese and Malays being excluded. In some portions the administration is in the hands of Dutch resident officers, but over a large area authority is delegated to various ranks of native sultans and chiefs, with their subordinates. The area of Dutch territory has been stated at 213,000 sq. m. (56,000 in the West Division, 157,000 in the South and East Division); the population at 1,625,000 (605,000 in West, 1,020,000 in South and East).

(5) *The Island of Labuan* (q.v.), off the coast of Brunei, has belonged to the British since 1846. Attached to the Straits Settlements since 1907, it was at first included in Singapore, but has been a separate Settlement since 1912.

The Chinese had commercial dealings with Borneo as early as the 5th century, but they made no settlement for a long time after. The Malay kingdom of Borneo proper dates back to the 13th

century. Another Malay settlement of later origin, Sambas, was at first dependent on Johore (q.v.) in the Malay Peninsula. Sukadana was founded by Hindu Javanese from the kingdom of Majapahit (see JAVA), and spread its influence on the whole south part of the west coast. Mampawa was a Buginese settlement, and Pontianak was founded as late as 1771 by a colony of Arabs, Malays, and Buginese. Islam began to be preached by Arabs from Palembang in the 16th century.

The Portuguese effected a settlement in 1690 at Banjarmassin; from which they were, however, soon expelled. The Dutch succeeded in concluding a treaty of commerce with the princes of Banjarmassin. They erected a fort and factory in 1643, and a second in 1778 at Pontianak. The British made unsuccessful attempts in 1702 and 1774 to effect a settlement in Borneo, but within the 19th century acquired a preponderating influence on the north-western coast.

See Wallace, *Malay Archipelago* (1869); Burbidge, *Garden of the Sun* (1880); Frank Hutton, *North Borneo* (1885); Posewicz, *Borneo* (trans. 1892); Ling Roth, *Natives of Sarawak and British North Borneo* (1896); Haddon, *Head-hunters* (1901); Bezemer, *Nederlandsch Oost Indie* (1905); Nieuwenhuis, *In Central Borneo* (1902) and *Quer Dutch Borneo* (1904–7); Hose and MacDougall, *Pagan Tribes of Borneo* (1912); Shelford, *Naturalist in Borneo* (1917); Lumholtz, *Through Central Borneo* (1921); Rutter, *British North Borneo* (1922); Evans, *Among Primitive Peoples in Borneo* (1922).

Borneo Camphor (Borneol), a variety of camphor produced in Sumatra and Borneo, is obtained from the tree *Dryobalanops camphora*, and is specially prized by the Chinese.

Borneo Tallow. See DIPTEROCARPACEÆ.

Bornholm, an island in the Baltic Sea, belonging to Denmark, about 90 miles E. of Zealand, to the SE. of the Swedish coast. Area, 226 sq. m. It is rocky, and traversed from north to south by a high mountain-ridge (511 feet), the slope of which is in great part a waste heath, but elsewhere it is not unfertile, and agriculture and cattle husbandry are successfully prosecuted. High cliffs, sand-banks, and breakers make the coast dangerous. The most notable product of the island is porcelain-clay, with freestone, limestone, blue marble, and coal. The capital of the island is Rønne or Rottum, on the western coast, a place of 10,000 inhabitants. Pop. 50,000.

Borning, or **BONING**, is a process of judging of the straightness or level of a surface or line by the eye, which looks along two or more *borning* or *boning rods* or *pieces* set up for the purpose. The term is used by masons, surveyors, and gardeners.

Bornu, a Mohammedan state of Central Sudan, bounded on the E. by Lake Tchad, and N. by the Sahara, and now mostly in Nigeria (British), but partly in the part of Cameroon under British mandate. Much of the country is perfectly level, and is liable to be overflowed in the rainy season (October to April). The heat from March to June is excessive, ranging from 104° to 107° F. The two principal rivers are the Shari and the Komaduga Yaobe, both of which fall into Lake Tchad. The soil is fertile, yields plentiful crops of maize, millet, and other tropical produce. Wild beasts are very numerous. Coats-of-mail are made both for horses and their riders. The population, which is estimated at about five millions, are mostly of negro race, and called Bornuese or Kanuri. The ruling race, called Shuwas, are of Arab descent and bigoted Mohammedans; but many traces of fetichism remain among the masses. Whatever they have of civilisation is derived from the Arabs. The shores and islands of Lake Tchad are inhabited by negro pirates called

Yedina or *Budduma*. The slave-trade formerly flourished in Bornu. In the beginning of the 19th century Bornu was conquered by the Fellatahs, whose yoke, however, was soon shaken off under the leadership of a fanatic fakir named Mohammed-el-Amin. The ruins of Birni, the old capital, on the Yaobe, may still be seen. Kuku or Kukawa, the present capital, on the west shore of Lake Tchad, has a population of about 60,000, and is one of the great centres of trade in the Sudan, carried on by caravan routes across the Sahara. See Dr A. Schulze's *Sultanate of Bornu* (trans. 1913).

Boro Budor (the 'Great Buddha'), the ruin of a splendid Buddhist temple in Java, residency Kadu, 20 miles north-west of Djokdjokarta, is the most elaborate monument of the Buddhist style of architecture anywhere existing. Buddhism was early introduced into Java, and Javanese chronicles place the building of the temple in the beginning of the 7th century; there are no inscriptions, but it was probably finished between 1400 and 1430. Boro Budor is built on a low hill,



Half-elevation of one side of Temple of Boro Budor.

between four vast volcanoes, which supplied the blocks of trachyte of which the edifice is built; its height to the cupola is 118 feet. It is a pyramid of a square form, each side at the base measuring 520 feet, and consists of seven walls, which are built like the steps of a stair up a hill. Between the walls are narrow terraces running round the building; in each is an arched doorway leading to the next higher terrace. These walls are richly ornamented with statuary. Outside are over 400 niches topped with fantastic domes, and each occupied by a large statue of Buddha. Between each of these are bas-reliefs, including figures of the god seated, and architectural ornaments and carvings of all sorts. Below the niches, on the lower story, is an immense bas-relief running round the whole building, representing scenes from the life of Buddha, and religious subjects. The inner faces of the building are also profusely ornamented with bas-reliefs, representing battles, sea-fights, processions, and chariot-races, carried to an extent unrivalled by any other building in the world. Of the large reliefs alone there are over 2000; and most of them are as vigorously designed as they are carefully executed. Within the upper square terrace are three circular ones, the outer ornamented with 32, the next with 24, and the upper with 16 small bell-shaped shrines (*dagops*), each containing a seated statue of Buddha, which can be seen through the open works of their roofs. The whole is surmounted by a cupola, the principal and probably the most ancient part of the structure. It is now empty, a sunken chamber 10 feet deep representing what was, no doubt, a *dagop* intended to contain the precious relic for which this splendid temple was erected. The niches containing the cross-legged figures have been supposed to be a copy, in durable architecture, of the

cells of a Buddhist monastery, each occupied by a shaven priest; the cupola is rather to be classified with the topes or stupas of Afghanistan. The structure is thus a compound of a Tope (q.v.) with a durable copy of the frail cells of a Vihara.

See Leemans, *Boro-Boedoer* (Leyden, 1873); Scheltema, *Monumental Java* (1913).

Borodin, ALEXANDER PORFYRIEVICH (1834-87), Russian composer, was born and died in Petersburg. He was first an army doctor, then a professor of chemistry. He composed songs, chamber music, symphonies, and the unfinished opera *Prince Igor* (completed by Rimsky Kornakov and Glazunov).

Borodino, a village of Russia, on the Kaluga, an affluent of the Moskwa, 70 miles W. of Moscow, gave name to a great battle between the French under Napoleon and the Russians under Kutusoff, 7th September 1812, one of the most obstinately disputed in history. The loss on both sides was almost equal. Out of 257,000 men engaged, between 70,000 and 80,000 were killed and wounded. The Russians retreated on the following day, but in the most perfect order, and therefore claim victory; but the honour certainly belongs to the French, who name the battle from the Moskwa.

Boroglyceride, prepared by heating together 62 parts of boric acid and 92 of glycerine, is extensively used as a food-preservative and antiseptic.

Boron (sym. B, eq. 11) is a non-metallic element present in boracic acid and Borax (q.v.). It was discovered in 1808 by Gay-Lussac and Thenard in France, and Davy in England. In some respects boron resembles carbon, existing like it in the so-called amorphous, graphitoid, and diamond forms. In the amorphous or pure state, prepared by heating boric anhydride with sodium, it is an olive-green powder, very slightly soluble in water, and unaltered by exposure to moist air. When heated in air, it takes fire, uniting with oxygen to form boric anhydride, B_2O_3 (see BORACIC ACID). The graphitoid and diamond boron are not pure forms of the element, but contain a definite proportion of Aluminium (q.v.). The diamond boron is obtained by heating the amorphous form to a high temperature, along with aluminium, when boron is left as minute crystals interspersed through the earth alumina. These crystals possess great interest from their similarity in properties to pure crystallised carbon, or the diamond. They are remarkably transparent, are tinged yellow or red (though the colours may be accidental), and rival the ordinary diamond in their lustre and refractive power. Boron diamonds not only scratch glass, but also the corundum and the sapphire; they are, however, somewhat softer than real diamonds. It was at first hoped that as the method of manufacture became perfected they would be obtained sufficiently large to become a serious rival to the diamond. They are very indestructible, even withstanding a temperature high enough to burn the true diamond.

Boron forms no compound with hydrogen, forms but one oxide, boracic or boric anhydride, B_2O_3 , while it unites with chlorine and bromine directly to form a chloride, BCl_3 , and bromide, BBr_3 .

Bororos, a numerous and powerful people of southern Brazil, inhabiting the upper basins of the Paraná and the Paraguay. Exceptionally tall, they are thought by some to be the parent stock of the Patagonians. They are hunters, and use large bows.

Borough, in Scotland BURGH (O.E. *burg*, *burh*, *buruh*; in the dative, &c., by umlaut, *byrig*, from *byrg*, whence the form *bury* in some place-names whose modern pronunciation is possibly but not necessarily of Kentish origin), meant formerly a fortification or castle, and latterly the

aggregate of houses, churches, and other structures, which in unsettled times were usually gathered under the walls of a castle, together with their inhabitants, and the arrangements which were made for their government. The questions whether we owe our municipal corporations to Roman, or to Saxon and other Teutonic influences, or to both; and if to both, then to what extent they have severally contributed to their formation, have been keenly discussed by constitutional historians. In so far as etymology goes, its authority is pretty equally divided, the term *municipal*, from the Latin *municipalis*, and *city*, from *civitas*, favouring the Roman view; whilst *borough*, from the root above indicated, and *town*, from the Anglo-Saxon *tūn*, 'an inclosure' (cf. Ger. *zaun*, 'hedge'), support the Teutonic. But the discussion forms a branch of a very wide subject, which has divided recent writers into two opposite schools. The Teutonic side is espoused by most of the Anglo-Saxon scholars of England, and in general by German writers. But from whatever source derived, that the boroughs of England in Saxon times existed, not as aggregates of houses merely, but as organised or quasi-corporate bodies, is now generally admitted. The burgh system of Scotland is also of great antiquity. A *Hanse*, or confederation of free burghs for mutual defence and the protection of trade, existed in Scotland, and was known by this name in the reign of David I. (1124-53), more than a century before the formation of the Hanseatic League of the continental cities; and the famous Burgh Laws date from about the same period. 'This code of Scotch burghal regulation,' in Mr Cosmo Innes's opinion, 'though collected in the reign of David, and sanctioned by him, was the result of the experience of the towns of England and Scotland'; and Mr Innes points out the close resemblance between these laws and the burghal usages of Newcastle, and even of Winchester, which seems to suggest their common Saxon origin. Mr Innes also speaks favourably of the burgh life of our ancestors, and considers the burgh domestic architecture, of which monuments remain, sufficient to show that 'the burghess of the Reformation period lived in greater decency and comfort than the laird, though without the numerous following, which no doubt gave dignity if it diminished food.'

Of the boroughs and cities of the middle ages, some were entirely free; they had, like the provincial towns of Italy before the extension of the Roman conquests, a constitution independent of any other powers. Venice, Genoa, Florence, Hamburg, and Lübeck all stood in this position. Next in dignity were the free imperial cities in Germany, which, not being comprehended in the dominions of any of the princes, were in immediate dependence on the empire. Most of these cities rose into importance in the 13th century; and their liberties and privileges were fostered by the Franconian emperors, to afford some counterpoise to the growing power of the immediate nobility. Nürnberg was especially celebrated for its stout resistance to the House of Brandenburg, and the successful war which it waged with the Franconian nobility. In England, the more important cities were immediate vassals of the crown; the smaller municipalities sometimes owned a subject superior, sometimes a greater municipality for their overlord.

Under the Anglo-Saxons, the English boroughs were subject to the rule of an elective officer, called the 'Portreve,' who exercised in the borough functions similar to those of the shire-reve in the shire. The Norman conquerors recognised the already existing privileges of the towns by granting them charters. Instead of a shire-reve, a viscount was placed by the king over each shire, and a bailiff

instead of the former elective officer over each borough. In the larger towns, the bailiff was allowed to assume the Norman appellation of Mayor. The municipal franchise seems to have been vested in all the resident and trading inhabitants, who shared in the payment of the local taxes, and performance of local duties. Titles to freedom were also recognised on the grounds of birth, apprenticeship, marriage, and sometimes free gift.

In all the larger towns during the Norman reigns the trading population came to be divided into guilds, through membership of which admission was obtained to the franchise. Eventually the whole community in a borough was enrolled in one or other of these, each of which had its property, its by-laws, and its common hall, and the community elected the chief officers. It was on the wealthier and more influential inhabitants that municipal offices were generally conferred; and the practice gradually gained ground of these functionaries perpetuating their authority without appealing to the popular suffrage. Contentions and disputes arose regarding the right of election, and eventually the crown threw the weight of its influence into the scale of self-elective ruling bodies. As the greater municipalities grew in strength, we find their right recognised to appear in parliament by means of representatives. The sheriffs were considered to have a discretionary power to determine which towns should, and which should not have this privilege of representation. The sovereigns of the House of Tudor and Stuart acquired the habit of extending the right of parliamentary representation to boroughs not in the enjoyment of it, while at the same time, by granting or renewing to them municipal charters, they modelled the constitution of these boroughs to a self-elective type, and restricted the right of voting in the choice of a representative to the governing body. During the reigns of William III., Anne, and the earlier Georges, the influence of the crown was largely employed in calling new municipal corporations into existence, with a view of creating additional parliamentary support for the ministry in power. The burghs of Scotland had a history much like that of the boroughs of England; their charters in early times were often mere recognitions of already existing rights, and were granted to the inhabitants at large.

In its modern sense, a borough (*or* burgh) is commonly understood to mean either an incorporated city or other town that sends burgesses to parliament—a privilege the nature and extent of which will be explained under Parliament (q.v.), or simply an incorporated city or town having municipal government. Apart from their importance as areas for the parliamentary franchise, boroughs are important units of local government in the United Kingdom. Following, as a necessary consequence, the great change in the political franchise introduced by the Reform Act of 1832, came the reconstitution of the municipal corporations—separate acts of parliament for this purpose having been passed for England, Scotland, and Ireland respectively within the succeeding ten years.

I. In England, by the Municipal Corporations Act, 1835, one definite form of government was imposed upon boroughs, and all charters, customs, &c. inconsistent with the purpose of the act were abrogated. Of municipal boroughs in England, 178 were included in the Act of 1835, differing greatly both in population and rateable area. By the Municipal Corporations Act, 1882, the last-mentioned act and various amending statutes were consolidated and amended. The boroughs are governed by town-councils, consisting of a mayor, aldermen, and common council of burgesses. The mayor and aldermen are chosen

by the council, and the councillors are elected by ballot by the burgesses. They serve gratuitously; but in London and many large boroughs the mayors receive an allowance. The qualification required for a councillor or alderman is, in addition to ordinary burgess-ship, £1000 property, or £30 rating, in the larger boroughs (when divided into four or more wards), and £500 property, or £15 rating, in other cases. On the other hand, the qualification required for the municipal franchise is occupation of house or lands, as owner or tenant, during the qualifying period, or being the wife of one so qualified. Females are entitled to exercise the municipal franchise, and to be elected to the council, and become mayor. The tenure of office is in the case of the mayor one year, in the case of the aldermen six years, in the case of the councillors three years. The town-clerk, the treasurer, and other officials are appointed by the council, and receive fixed salaries.

Many of the larger boroughs possess a separate commission of the peace. Under the Municipal Corporations Act the mayor and ex-mayor are *ex officio* justices of the peace, and the other borough magistrates are appointed by commission from the crown. They are as magistrates unpaid, but in some of the larger boroughs a stipendiary magistrate for judicial work has been appointed by the crown on the application of the town-council, his salary being paid out of the borough funds. A borough may also obtain the right by petition to the crown to hold a separate quarter-sessions, which involves the appointment of a salaried recorder and clerk of the peace. This gives freedom from control of county justices, and from payment of county rate.

As regards the administrative functions of the corporation, the principal are to provide for the watching (by means of a force of borough constables) and the lighting of the borough, as prescribed by the Municipal Corporations Act, 1882; and to enforce the sanitary laws under the Public Health Acts, 1873 and 1875. In its capacity as sanitary authority, the town-council has power to regulate sewerage, burial-grounds, water and gas supply, common lodging-houses, baths, and other sanitary matters. The execution of the Elementary Education Acts has also been entrusted to the borough councils where the population of the borough exceeds 10,000 (school-boards having been abolished in 1902 by 2 Edward VII. chap. 42); and certain other functions have been assigned to them, such as the regulation of weights and measures, and the establishment of free libraries.

Expenses of Administration.—The expenses incurred by the council in the exercise of their functions are ordinarily defrayed out of the *Borough Fund*, supplemented where necessary by a *Borough Rate*. The borough fund was expressly defined by the Municipal Corporations Act, 1835, which declared that the rents and profits of all hereditaments, and the interest, dividends, and annual proceeds of all moneys, dues, chattels, and valuable securities belonging or payable to any body corporate named in conjunction with a borough in the schedules, or to any member or officer thereof in his corporate capacity, and every fine and penalty for any offence against this act (the application of which has not been already provided for), shall be paid to the treasurer of such borough; and all the moneys which he shall so receive shall be carried by him to the account of a fund to be called 'the Borough Fund'; and such fund, subject to certain payments and deductions, shall be applied towards the payment of the salary of the mayor, and of the recorder, police magistrate, town-clerk, treasurer, and other officers, and towards various other ex-

penses. In a few favoured boroughs the borough fund is large enough to meet the whole costs of administration and to leave a surplus, which must be applied, not as of old in private bounties, but for the benefit of the inhabitants and improvement of the town. The borough rate, on the other hand, which has to be levied to a greater or less extent in most boroughs, is similar to the county rate. Authorised by the Municipal Corporations Act to be levied in all cases where there is a deficiency of borough fund, it is intended to meet the maintenance of the police force, borough jail, public baths and wash-houses, public libraries, parks and cemeteries, and lunatic asylums, together with 'general expenses.' These 'general expenses' include the expense of paving, lighting, sewerage, and all appropriate town improvements. The school rate is also included in the borough rate. Where parties consider themselves aggrieved by a borough rate, they may appeal to the recorder at the next quarter-sessions for the borough; or, if there be no recorder, to the next county quarter-sessions.

Besides boroughs proper under the Municipal Corporations Act, there have been other organisations of a burghal character with administrative boards possessing many of the powers of town-councils. Of 'Local Government Districts,' a very large number were constituted under the Public Health and Local Government Acts, and the 'Improvement Act Districts' were constituted under various local acts. Certain semi-urban districts were constituted under the Lighting and Watching Act, 1833.

The Local Government Act of 1888, which established county councils, also created a new description of borough—viz. county boroughs (see COUNTY). By this act towns of not less than 50,000 inhabitants were given powers of municipal administration wholly independent of the county councils, while those of less than 10,000 inhabitants had their powers and duties transferred to the county councils. The governing bodies under the Public Health Acts and other acts were made uniform and became urban or rural district councils, and were made the public health and highway authorities for the respective districts. For the unique position of the City of London with the metropolitan boroughs, see the article LONDON.

II. In Ireland the term *Borough* is not much used as a designation for cities and towns, either in their parliamentary or municipal character. The history of burghal life in Ireland prior to last century shows an absence of that free and vigorous life which was to be found in the sister-kingdoms. The Irish towns are partly corporate, partly governed by commissioners. The corporate towns, or boroughs proper, were regulated by the Irish Municipal Reform Act, 1840. Eleven corporate boroughs are each governed by a mayor, aldermen, and councillors, the numbers varying from sixty in Dublin to twenty-one in Wexford. Aldermen and councillors are elected for three years, and administer the ordinary affairs of the borough, such as lighting, cleaning, watching, and all sanitary business.

The Local Government Act, 1898, assimilated local government in Ireland to that of England and Wales. It established three groups of municipal organisation—(1) county boroughs; (2) urban districts; and (3) certain smaller towns with commissioners, but having their rates assessed by their county councils. The county boroughs (which include only six of the corporate boroughs mentioned above—viz. Dublin, Belfast, Cork, Limerick, Londonderry, and Waterford) have had no substantial change made in their organisation beyond the extended franchise. The urban districts include the other five corporate boroughs (which retain

their corporations), and unincorporated towns of a certain size. They have the administration of the Public Health and Housing of the Working-classes Acts, are independent, and raise their own rates. All the governing bodies are now elected on the parliamentary franchise, all the old property qualifications and privileges being abolished. Women may sit on urban, and now also on county, councils. There are many small towns which, having no municipal authorities, fall within the rural administration.

III. In Scotland, the word *burgh* corresponds to the English *borough*. There were originally three distinctive classes of burghs—viz. *burghs of barony*, *burghs of regality*, and *royal burghs*. The effect of the Reform Act, 1832, was to bring into existence a new class—what are called *parliamentary burghs*—i.e. towns or burghs not being royal burghs, but sending or contributing to send representatives to parliament, under the Act 2 and 3 Will. IV. chap. 65. Besides these, the necessities of modern urban life have created yet another class; for, by the General Police Act for Scotland, the word *burgh* was declared to mean also any 'populous place,' the boundaries of which are fixed by the act.

(1) **BURGHs OF BARONY** are corporations consisting of the inhabitants of determinate tracts of ground within the *Barony*, and municipally governed by magistrates and a council (or sometimes by magistrates alone), whose election is either dependent on the baron superior of the district, or vested in the inhabitants themselves. Sometimes their charter of incorporation gave them power to create subordinate corporations and crafts, as in royal burghs; but all exclusive privileges of trading in burghs are abolished by the 9 and 10 Vict. chap. 17. The magistrates (along with the council when there was one) have power to administer their corporate property (*common good*, as it is called), to elect their burgh-officers, and to make bye-laws. They may be (where the inhabitants so resolve) the local authority for executing the provisions of various statutes affecting urban interests—as, for instance, matters of police under the General Police Acts, 1850 and 1862; and sanitary matters under the Public Health Act, 1867. But where separate police commissioners have been elected for burghs of barony, separate from the burgh council, the administrative functions of the latter become merged in those of the former. A proportion of the land-tax is payable by burghs of barony.

(2) **BURGHs OF REGALITY** were burghs of barony, spiritual or temporal, enfranchised by crown charter, with regal or exclusive criminal jurisdiction within their own territories, and thence called *Regalities*. Some of these burghs of regality, especially those which were dependent on the greater bishops and abbots, were of high antiquity, and possessed jurisdiction and privilege of trade only distinguishable from those of royal burghs by being more circumscribed in their limits. Since the abolition of hereditary jurisdictions, by the Act 20 Geo. II. chap. 43, the distinction between burghs of regality and burghs of barony has ceased to be of any practical importance.

(3) **ROYAL BURGHs**.—A Royal burgh is a corporate body deriving its existence, constitution, and rights from a royal charter—such charter being either actual and express, or presumed to have existed, and by the accident of war and time to have perished. By a Scots act passed in 1469, a constitution was given to royal burghs, by which the right of appointing their successors belonged to the old councils, the act also containing the singular provision, that when the new council was chosen, the members of it, along with those of the old council, should choose all the office-bearers of the

burgh, each craft or trade corporation being represented at the election by one of themselves. But this simple plan was not universally adopted, and the election gradually lost its former free and popular form—a close and exclusive proceeding being ultimately established in its place. This 'close system,' as it has been called, notwithstanding its repugnance to the spirit of the times and modern ideas of public administration, continued in force until the year 1833, when an act of parliament was passed, the 3 and 4 Will. IV. chap. 76 (amended by the 4 and 5 Will. IV. chap. 87, and the 16 Vict. chap. 26), by which it was abolished, and an entirely new constitution given to royal burghs, with the exception of nine of them, which, on account of the smallness of their population, were left unchanged till the passing of the Municipal Elections Amendment Act (Scotland) in 1868.

At the union of England and Scotland there were seventy royal burghs, all of them except four (viz. Auchtermuchty, Earlsferry, Falkland, and Newburgh) returning members to the Scottish parliament. Two royal burghs (Rothesay and Peebles) were deprived of the burgh parliamentary franchise in 1832, nine (Stranraer, New Galloway, Whithorn, Wigtown, North Berwick, Haddington, Dunbar, Jedburgh, and Lauder) in 1885, and many others in 1918. One town—viz. Coatbridge—was created a municipal burgh with the municipal privileges of royal burghs by special act of parliament in 1885.

Under the Municipal Acts of 1833 and 1868 burghs are governed by corporations composed of a provost, magistrates, and councillors elected by the citizens. The number of members of a town-council varies. By the Representation of the People Act, 1918, a man is qualified for registration as an elector if he is owner or occupier of lands and heritages of the yearly value of £10, or occupier as owner or tenant of a dwelling-house, or occupier of lodgings worth £10 unfurnished. A woman is qualified on the same conditions; or if she is the wife of a man so qualified, and is over thirty years of age. The councillors are chosen from among the electors residing, or personally carrying on business, or holding property within the royalty; and formerly, where there was a body of burgesses in the burgh, each councillor, before his induction, required to be entered a burgess, but by an act passed in 1876 the right of burgess-ship was practically extended to all resident ratepayers. By 44 and 45 Vict. chap. 13, sect. 2, women who were unmarried, and married women living separate from their husbands, were admitted to the municipal franchise, but they could not till 1907 be elected town-councillors. The electors of Edinburgh, Glasgow, Aberdeen, Dundee, Perth, and several other of the larger burghs, are divided into wards. At the election immediately succeeding the passing of the act, each ward elected six councillors; but as every year the third part of the council goes out of office in the order prescribed by the act, two councillors are now annually chosen by each ward, there being no bar, however, to the re-election of an outgoing councillor. It is now competent for burghs with a population above 5000 to be divided into wards for the purpose of municipal as well as parliamentary elections by resolution of a majority of two-thirds of the council to that effect. The electors in other burghs choose the whole council exactly as these wards do their proportion of it, and consequently elect each year a third part in place of that which has retired. Upon the third lawful day after the election succeeding the passing of the act, the councillors meet and choose, by a plurality of voices, a provost, bailies, treasurer, and other office-bearers, as existing in the council by the 'sett' or usage of the burgh. Vacancies taking place

during the year by death or resignation are supplied, *ad interim*, by the remaining members of the council, and the persons so elected by the councillors retire at the succeeding election. The rights of the guildry, trades, &c. to elect their own dean of guild, &c., are still preserved; but these officers are now no longer recognised as constituent members of the council, their functions being performed by a member of the council, elected by a majority of the councillors. In Aberdeen, Dundee, and Perth, however, the dean of guild, and in Edinburgh and Glasgow the convener of trades and the dean of guild, are, *ex officio*, members of council; and the electors in all the above-named burghs choose such a number of councillors as, together with these officers, makes up the proper number. No magistrate or councillor can be town-clerk. The magistrates and council possess the same powers of administration and jurisdiction as were enjoyed by the magistrates and town-council before the passing of the act, and none of them is responsible for the debts of the burgh, or the acts of his predecessors, otherwise than as a citizen or Burgess. The existing council in all burghs royal must every year make up, on or before the 15th of October, a state of their affairs, to be kept in the town-clerk's or treasurer's office. The administration, powers, rating, &c. are similar to those of municipal boroughs in England.

From an early period in Scottish history the royal burghs have been in use to consult together and take common action in matters concerning their welfare. Evidence of this is found so far back as the middle of the 12th century, when the court of the Four Burghs (Edinburgh, Berwick, Stirling, and Roxburgh) met under the presidency of the High Chamberlain of Scotland. This court was superseded in the 15th century by the meeting of representatives of all the royal burghs. This was called the *Convention of Royal Burghs*, and according to the Scottish Act, 1487, chap. 3, which organised it, the duties of the convention were to deal with 'the welfare of merchandise, the gude rule and statutes for the common profit of burrows, and to provide for remeid upon the skaith and injuries sustained within the burrows.' The convention still meets annually in Edinburgh, and though shorn of much of its previous influence, it still shows a considerable amount of vitality, particularly in furthering legislative measures which may be useful to trade. The convention is recognised as a corporation. The proportion of the land-tax payable by royal burghs is also adjusted by the convention. By an act passed in 1879, parliamentary burghs (see below) are enabled to send representatives to the convention.

(4) **PARLIAMENTARY BURGHS.**—For municipal purposes these burghs stand practically in the same position as royal burghs, being regulated by the Municipal Reform Acts of 1833 and 1868. The boundaries of parliamentary burghs, being fixed for the first time by the Reform Act of 1832, were adopted by later acts for municipal purposes. By the Burgh Police Acts, 1892 and 1903, these boundaries can be modified. A number of parliamentary burghs were previously burghs of barony and regality, their character as the latter being merged in the former. Many were merged in county constituencies in 1918.

(5) **POLICE BURGHS.**—Prior to 1883 it was necessary for towns desiring to make provision for police and sanitary matters to obtain special acts of parliament for the purpose. In that year the first General Police Act was passed, laying down certain general provisions for watching, lighting, and cleansing, which might be adopted by a royal, regality, or barony burgh. Other general acts were passed in 1850 and 1862 (25 and 26 Vict.

chap. 101), but the existing General Police Act was passed in 1892 (55 and 56 Vict. chap. 55), amended in 1893 and 1894, which superseded the earlier ones. In the last-named act 'burgh' includes ordinarily all burghs and populous places whose boundaries have been fixed; and it is provided that the sheriff may fix the boundaries and so constitute a burgh in this sense, for purposes of improvement and police, at the instance of the magistrates and council or of any seven or more householders.

The local authority in purely police burghs is the police commissioners. Their number varies, and in the case of towns divided into wards the number must be so arranged that each ward be represented by three members. The commissioners are elected in the ordinary way. The commissioners hold office for three years, retiring annually by thirds, or as nearly as may be. They choose magistrates, one senior or chief, called provost, and two or more junior magistrates. The principal administrative functions of the commissioners are watching, paving, cleansing, lighting, and improving the burgh. The expenses are defrayed by a rate called 'Police Assessment,' levied upon occupiers of lands within the burgh.

Four of the Scottish burghs are technically termed 'counties of cities'—namely, Edinburgh, Glasgow, Dundee, and Aberdeen. The Town Councils (Scotland) Act of 1900 consolidates and, in various matters of detail, amends the law relating to the election and proceedings of town-councils in Scotland.

BURGH LAWS (*Leges Burgorum*), in Scottish legal history, was the name given to a collection of ancient laws relative to burghs, which claim to have been enacted in the reign of King David I. in the 12th century. See REGIAM MAJESTATEM.

In the United States of America and in the British colonies, cities and towns have grown up and have been organised in accordance with (speaking generally) the most enlightened ideas of modern civic life. According to the opinion of American constitutional lawyers, the city or borough organisation is regarded as a grant from the state for the purpose of carrying out minor matters of civil government in urban communities. It has attached to it the general powers inherent in all corporate bodies, with powers to make bye-laws.

See the articles BURGESS, CITY, CORPORATION, COUNTY, EDUCATION, GUILDS, LICENSING LAWS, LIVERY, LOCAL GOVERNMENT, MAYOR, MUNICIPALITY, PARLIAMENT, PROVOST, and TOWNSHIP; Gneist, *Self-government* (3d ed. 1871) and other works; Webb, *English Local Government* (1908); Redlich and Hirst, *Local Government in England* (1903); the Cobden Club Essays on Local Government and Taxation (1875 and 1882); Rogers, *Registration, Parliamentary and Municipal* (new ed. by Carter, 1887); books on the history and law of municipal corporations by Arnold, Chambers, Lely, Owen, Rawlinson, Saunders, Vine, &c.; Mrs Green, *Town Life in the 15th Century* (1894); Albert Shaw, *Municipal Government in Great Britain* (1895); F. J. Goodnow, *Municipal Home-Rule* (1895); F. Dolman, *Municipalities at Work* (1895); Maine, *Early Institutions*; Stubbs, *Constitutional History*; and Maitland, *Township and Borough* (1898).

Boroughbridge, a small market-town of Yorkshire, on the Ure, 21½ miles NW. of York. Edward II., in 1322, defeated the Earl of Lancaster here. Hard by are three great monoliths, called the 'Devil's Arrows,' 16 to 22 feet high.

Borough English is a custom that prevails in some ancient boroughs in England, according to which the youngest son inherits the heritable property within borough in preference to his elder brothers. The origin of this custom has not been satisfactorily determined. One reason assigned for it is that the youngest son, on account of his tender age, is not so capable as his elder brothers

to maintain himself. Another explanation is that it was the result of the so-called *jus primæ noctis*—a barbarous feudal custom by which a feudal overlord is said to have obtained the right of concubinage with the wife of his vassal on the night of her wedding; but the existence of this custom is more than doubtful. Maine suggested that it was derived from the *Patria Potestas* (see FAMILY); Elton that it is a survival from pre-Celtic, pre-Aryan usages. A posthumous son is entitled to this privilege, and dispossesses his elder brother. The right of representation also exists with reference to it, for should the youngest son die in his father's lifetime leaving a daughter, she will inherit the property. This custom obtains in parts of Kent, Surrey, Sussex, Middlesex, Somerset, and more rarely elsewhere. See GAVELKIND, INHERITANCE, PRIMOGENITURE; Elton, *Origins of English History* (1882); Pollock and Maitland, *History of English Law* (1895).

Borovitchi, a town of Russia, on the river Msta, 98 miles E. of Novgorod; pop. 10,000.

Borovsk, a town of Russia, 49 miles NNE. of Kaluga. Near it is a convent founded in 1477, once one of the richest in Russia. Pop. 10,000.

Borromean Islands, a group of four small islands on the west side of Lago Maggiore, Northern Italy. They are situated in the western arm of the lake, and are named after the ancient family of Borromeo. Vitaliano, Count Borromeo, about 1671, caused soil to be carried to them, built terraces, and converted them into beautiful gardens. The two most celebrated are *Isola Bella* and *Isola Madre*. On the west side of *Isola Bella*, which rises above the water in ten successive terraces, stands a palace of the Borromeo family, containing many admirable paintings and other works of art. *Isola Madre* is laid out in the same terraced style, and is crowned by a now dilapidated palace. The *Isola de' Pescatori* is inhabited by about 200 fishermen. Jean Paul Richter has described the place in his *Titan*.

Borromeo, CARLO, ST, a great churchman and saint of the 16th century, was born 2d October 1538, at his father's castle of Arona, on the Lago Maggiore. He studied law at Pavia, took the degree of doctor in 1559, and next year was appointed in quick succession by his uncle, the new Pope Pius IV. (formerly Cardinal de' Medici), apostolic protonotary, cardinal, and Archbishop of Milan. As a counsellor of the pope the young cardinal showed wisdom beyond his years, did much to bring the Council of Trent to a successful conclusion, and had the principal part in drawing up the famous *Catechismus Romanus*. The saintly simplicity of his manners, his ardent piety, and his self-forgetful devotion to duty, united to make him the ideal bishop, and have kept his memory green until the present day. But his own severe morality and his determined efforts to maintain ecclesiastical discipline drew upon him the hostility of the monastic orders, and in 1569 a wretch of the order of the Uniliati actually shot at the archbishop as he knelt at prayer in his chapel. Borromeo devoted the greater part of his revenues to the relief of the poor, and during the famine of 1570, and the plague at Milan in 1576, showed such energetic benevolence and fearless devotion as to make his name a proverb throughout Christendom. To provide priests for Switzerland, he founded in 1570 the Helvetic College at Milan; and he brought about an alliance of the seven Catholic cantons. He gave his blessing to Campion and Parsons on their way to stir up rebellion in England. Exhausted by his labours and his austerities, he died 4th November 1584. He was canonised by Pope Paul V. in 1610. His embalmed

body may be seen in the crypt of Milan Cathedral. His works appeared in 1747 in 5 vols. folio. See Lives by Sailer, Dieringer, Sala, Sylvain, Giusano (trans. with preface by Cardinal Manning, 1884), and Thompson (1893).—His brother's son, COUNT FEDERICO BORROMEO, born 1562, was also from 1595 Cardinal-Archbishop of Milan, where he founded the Ambrosian Library. He died in 1631.

Borrow, GEORGE HENRY, was born at East Dereham, Norfolk, 5th July 1803. His father, Thomas Borrow, a captain of militia, during the war moved about with his regiment in England, Ireland, and Scotland (where Borrow attended the Edinburgh High School), then settled at Norwich, where young Borrow attended the grammar-school (1816-18), and for the next five years was articled to a firm of solicitors. Already he deserved his Gypsy title *Lavengro* ('word-master'), having picked up a knowledge of Irish, French, German and Danish (these two under 'Taylor of Norwich'), Welsh, Latin, Greek, even of Romany, the language of that strange Gypsy race of which he was almost an adopted member. On his father's death in 1824 he came up to London to seek his fortune, and fared ill as hack-writer to Sir Richard Phillips the publisher. Anon he wandered Gypsy-wise through England, and, on his wanderings, was all but poisoned by a Romany beladame, fought and vanquished the Flaming Tinman, with Isopel Berners tented in Mumper's Dingle, and met with other moving accidents (are they not chronicled in his own book, *Lavengro*?). Next—and here facts and dates are again realities, without any suspicion of fancy—as agent of the Bible Society he visited St Petersburg (1833-35), and Portugal, Spain, Morocco (1835-39). In 1840 he married a well-to-do widow, and settled down on a small estate of hers at Oulton, near Lowestoft, where, after travels in South-eastern Europe (1844), a tour in Wales (1854), and a residence of some years in London, he ended his days, 26th July 1881. The chief of his fourteen published works are: *The Zincali, or Gypsies of Spain* (1840); *The Bible in Spain* (1842); *Lavengro* (1851); its sequel *The Romany Rye* (1857); *Wild Wales* (1862); and *Romano Lavo-Lil, or Word-book of the English-Gypsy Language* (1874)—six works, of which the first three increased, as the last three fell off, in vigour and interest. All but the first and last are autobiographical; and even the *Zincali* and *Lavo-Lil* are full of the author's strong individuality. He has been likened to Cervantes, Defoe, Lesage; 'a Lesage in water-colours' is how he described himself. In truth, all three were in some ways his literary progenitors; none the less he is always original, always George Borrow, with his love of horseflesh, boxing, strong ale, and open-air life, his hatred of gentility, priestcraft, cant of any kind. His rare mastery of good strong English, his rarer power of depicting mankind and nature, are often marred by studied mannerisms, transparent mystifications, unreasoning crotchets, Manfred-like posings. Not that here lay his chief offending. He was too English for the squeamish age that preceded the gospel of 'Muscular Christianity'; and no writer so well worth reading is even nowadays so little read. In Mr Watts-Dunton's 'Reminiscences of George Borrow' (*Athenæum*, September 3, 10, 1881) we get a splendid picture of the man—his mighty figure, frank and childlike gaze, his fine East Anglian accent, his love of nature and love of adventure, his reverence and unwavering belief in God's beneficence, his talk—fresh, racy, whimsical—of all the wondrous things he had seen and heard in his wondrous life. 'No man's writing can take you into the country as Borrow's can; it makes you feel the sunshine, see the meadows, smell the flowers, hear

the skylark sing and the grasshopper chirrup. Who else can do it? I know of none.

In addition to his works mentioned above, Borrow compiled *Celebrated Trials* (6 vols. 1825); he edited the New Testament in Manchu (1835) and in Spanish (1837), and the Basque version of St Luke (1838); and he executed the following translations, in addition to translations which appeared in various periodicals: Klinger's *Faustus* (1825), *Romantic Ballads* (1826; reprinted 1913), *Targum, or Metrical Translations from Thirty Languages and Dialects* (1835; reprinted 1892), A. Pushkin's *Talisman* (1835), St Luke in Spanish Gypsy (1837), *Sleeping Bard, translated from the Cambrian British* (1860), *Turkish Jester* (1884), J. Ewald's *Death of Balder* (1889), and *Welsh Poems and Ballads* (1914). The *Letters of George Borrow to the British and Foreign Bible Society* were published in 1911. For information regarding Borrow's linguistic attainments and deficiencies, consult the editions of *Lavengro* by Dr Knapp (1900) and F. Hindes Groome (1901), and the edition of *The Romany Rye* edited by J. Sampson (1903). See the lives by W. I. Knapp (1899), R. A. J. Walling (1909), H. Jenkins (1912), and E. Thomas (1912); W. A. Dutt's *George Borrow in East Anglia* (1896); Watts-Dunton's *Introduction to Lavengro* (1893); Clement Shorter's *George Borrow and his Circle* (1913); R. T. Hopkins's *George Borrow* (1922); and the *Souvenir of the George Borrow Celebration* (1913), published when the Norwich residence of the Borrow family was presented to the Corporation by the Lord Mayor (A. M. Samuel, Esq.) for use as a Borrow Museum; bibliographies in E. Thomas's biography, and *The Readers' Guide*, vol. ii. no. 4 (1913), published by the Norwich Public Library.

Borrowdale, a beautiful Cumberland valley, ascending from the head of Derwentwater by Wordsworth's yew-trees towards Scafell. Its rich plumbago mine was exhausted in 1850 (see BLACK LEAD). Slate unfortunately is still quarried. The Honister Pass leads to Buttermere, but *vestigia nulla retrorsum*, so far as horse traffic is concerned.

Borrowing. See LOAN, INTEREST, USURY.

Borrowing Days, the last three days of March (old style), supposed in Scottish folklore to have been borrowed by March from April, and to be especially stormy. In Cheshire the first eleven days of May are called 'borrowed days,' because in old style they belong to April.

Borrowstounness. See Bo'NESS.

Borsad, a town in Bombay province, 24 miles NE. of Cambay; pop. 12,000.

Borsippa, a town of Babylonia, across the Euphrates from Babylon; latterly a suburb of Babylon. See BABYLONIA.

Borstal, $1\frac{1}{2}$ miles S. of Rochester, has great military establishments, and a prison in which, since 1901, the 'Borstal system' of reformatory treatment for 'juvenile-adult' prisoners, sixteen to twenty-one years of age, is carried out.

Bort. See DIAMOND.

Borthwick Castle, a tower, $13\frac{1}{2}$ miles SSE. of Edinburgh, founded in 1430.

Bory de Saint Vincent, JEAN BAPTISTE, (1780-1846), born at Agen, explored Bourbon, served in the army at Ulm and Austerlitz, on Soult's staff in Spain, and as a colonel at Waterloo. In 1829 he headed a scientific expedition to the Morea, in 1839 to Algeria. He wrote on his travels and on anthropology, and contributed to Liberal journals.

Boryslav, in Eastern Galicia, 7 miles SW. of Drohobycz, in a district rich in petroleum and ozokerite; pop. 12,000.

Borys'thenes. See DNIEPER.

Borzna, a town of Ukraine, 45 miles SE. of Tchernigov; pop. 13,000.

Borzoi. See WOLF-HOUND.

Bosa, a port and cathedral city on the west

coast of Sardinia, 85 miles NNW. of Cagliari; pop. 7000.

Bosboom, JON (1817-91), a Dutch painter at The Hague, who delighted in depicting interiors of churches.

Bosboom-Toussaint, ANNA LOUISA GERTRUIDA (1812-86), born at Alkmaar, was already distinguished as an historical novelist (*Almagro, De Graaf van Devonshire, &c.*) when she married (1851) the painter Bosboom. Another series of novels dealt with the Earl of Leicester in Holland. Her later works (in which *Major Frank* was the best known) were modern society novels.

Boscan-Almogaver, JUAN (1490?-1542), a Spanish poet, born at Barcelona of an ancient family, was tutor to the Duke of Alva. He was the first to use Italian measures in Spanish verse, and thus became the creator of the Spanish sonnet.

Boscawen, EDWARD, English admiral, third son of Viscount Falmouth, was born in 1711. He had an important share in the victory off Cape Finisterre (3d May 1747), where he was wounded in the shoulder. He displayed high military skill in conducting the retreat from Pondicherry, and in 1751 became a lord of the Admiralty. In 1755 he intercepted the French fleet off Newfoundland. In 1757 he was appointed second in command under Hawke, and in 1758 commander-in-chief of the successful expedition against Cape Breton. Boscawen crowned his career by his signal victory over the French Toulon fleet in the Bay of Lagos, 18th August 1759. He died 10th January 1761. Boscawen was notable for his ready and decisive courage; amongst the sailors he was known as 'Old Dreadnought.'

Bos'cobel, on the eastern verge of the county of Shropshire, 7 miles E. of Shifnal, and 37 N. of Worcester, was, after the defeat of Worcester (3d September 1651), for two days the hiding-place of Charles II. The 'Royal Oak' in which, with Major Careless, he concealed himself for more than twenty-four hours is represented by a tree grown from one of its acorns; but Boscobel House, then occupied by the Penderel family, still stands, a half-timbered dwelling. See Thomas Blount's *Boscobel* (1660-81); ed. by J. Hughes (1857), by C. G. Thomas (1894).

Bosco Rea'le, a village of south Italy, at the south base of Mount Vesuvius, 10 miles ESE. of Naples; pop. 10,000.

Boscovich, ROGER JOSEPH, a celebrated mathematician and astronomer, was born at Ragusa in 1711, and at an early age entered the order of the Jesuits. Before the completion of his course of studies in Rome, he was appointed teacher of Mathematics and Philosophy in the *Collegium Romanum* there; his reputation had been previously established by a solution of the problem to find the sun's equator and fix the time of his rotation by observing the spots. The pope gave him a commission to measure a degree of the meridian in the States of the Church. He was sent to London in 1760 in defence of the interests of Ragusa. In 1764 he was appointed to a professorship in Pavia, and subsequently at Milan. After the dissolution of his order in 1773, he went to Paris, received a pension from the king, and was appointed director of optics to the navy. Boscovich afterwards returned to Milan, but fell into a depression of spirits, which at last grew into complete insanity. He died in 1787. His works, on a great variety of important questions in mathematical and physical science, were published collectively under the title *Opera Pertinentia ad Opticam et Astronomiam* (5 vols. 1785). His name is connected with a molecular theory of

physics, first published in his *Theoria Philosophiæ Naturalis* (Vienna, 1758). He was also a poet, and his Latin poem, *De Solis ac Lunæ Defectibus* (1764), was dedicated to the London Royal Society, of which he had been elected a member.

Bosio, ANTONIO, a Roman antiquary, who died in 1629, was the first serious student of the Catacombs (q.v.). His *Roma Sotteranea*, the fruit of thirty-five years' work, appeared in 1632.

Bosio, FRANÇOIS JOSEPH, BARON, an eminent sculptor, born 19th March 1769, at Monaco, studied first at Paris, next in Italy, and first became famous by the figures which, at the request of Napoleon, he executed for the column in the Place Vendôme. Louis XVIII. and Charles X. also patronised Bosio; the former made him royal sculptor, the latter a baron. He died director of the Academy of Fine Arts in Paris, 29th July 1845.

Bosjesman. See BUSHMEN.

Bosna-Serai. See SARAJEVO.

Bosnia and Herzegovina, between Dalmatia and Slavonia, part of the Yugoslav state, long a Turkish province. The Berlin treaty of 1878 put it under the administration of Austria-Hungary. When, on occasion of the constitutional revolution in Turkey in the autumn of 1908, the united provinces were formally annexed by the dual monarchy, they had long virtually been part of it. The soil in both is fertile, but agriculture is not well developed, though cereals, flax, and hemp are grown. Herzegovina produces figs and fine tobacco, and Bosnia (which is largely under forest) is wonderfully rich in plums, exporting enormous quantities of prunes. The wine is not good; sugar-beet is now being grown. Cattle-grazing and sheep-farming are important industries, and live-stock is exported. The commerce is largely in the hands of the numerous Spanish-Jews long established in Bosnia. There are many Gypsies, and the population, both in Bosnia and Herzegovina, is typically Slav, of the Croato-Serbian branch. Under the constitution of 1910, which established a joint diet chosen by universal suffrage for the united provinces, Sarajevo, heretofore capital of Bosnia, became the administrative centre. Mostar, the old capital of Herzegovina, has about 16,000 inhabitants. The religious position is indicated by the fact that in the diet the Greek-Orthodox had allotted to them 31 seats, the Roman Catholics 16, the Mohammedans 24, the Jews 1. The Mohammedans own more than their proportionate share of landed property. Bosnia resembles Styria or Tyrol in its rugged mountainous character, its dense forests, and in the picturesqueness of its valleys. The Dinacic Alps, here attaining a maximum altitude of 7663 feet, form the water-parting between the Adriatic and Danube basins; and four rivers—the Unna, the Vrbas, the Bosna (from which the province takes its name), and the Drina—flow northwards to their confluence with the Save. Herzegovina, on the other hand, is an ill-watered country of limestone mountain masses, whose valleys are exposed in summer to broiling heat. With the exception of the Jews, Tsigans (Gypsies), a few Bulgarians and Albanians, and some Osmanli Turks, who live in the larger towns of Bosnia, all the inhabitants of the Illyrian Alps are Slavs. The Bosnians themselves, though united by race, are divided by religion, Mussulman against Christian, Greek-Orthodox against Roman Catholic. Hence, in spite of every natural advantage, they were, unlike their Serbian brethren, unable to emancipate themselves from the Turkish yoke.

The area of Bosnia is 16,200 sq. m.; of Herzegovina, 3500—jointly 19,700 sq. m. In 1920 the population was 1,876,543. About 88 per cent.

of the population are engaged in agriculture. Minerals (coal, iron, copper, manganese, &c.) are abundant. *Herzegovina* is a Slav formation from the German *Herzog*.

History.—Bosnia, in ancient times a part successively of Illyria, Pannonia, and Dalmatia, was during the great migrations occupied by Slavs or Slavonised Illyrians, at first dependent on Hungary; but it became a kingdom in 1376, under Tivartko, a native prince. Occupied by the Turks in 1401, it was annexed in 1463, but not recognised by Europe as a Turkish province till 1699. Extortionate taxation caused a rebellion of the Christians in 1849, suppressed by Omar Pasha; but a more determined rising in 1875, which the Turks failed to put down, led to the occupation of the province by the Austro-Hungarians, which the Moslem population opposed in a fierce but unavailing struggle. The treaty of Berlin formally entrusted the administration to Austria-Hungary. In October 1918 the province participated in the founding of the Yugoslav state. Since 1880 extraordinary progress has been made in roads, railways, finance, and commerce. See A. Evans, *Through Bosnia and Herzegovina on Foot* (1876); Asbóth, *Bosnia and Herzegovina* (trans. 1889); Munro, *Bosnia, Herzegovina, and Dalmatia* (2d ed. 1900); and books cited at BALKAN PENINSULA.

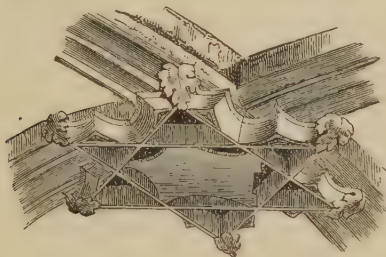
Bosporus (also BOSPHERUS, Latinised forms of a Greek word meaning 'ox-ford'), the ancient name of the channel which separates Europe from Asia, and connects the Black Sea (*Euxine*) with the Sea of Marmora (*Propontis*). It was so called, according to the legend, from Io, who swam across in the form of a cow. Afterwards, as the same name was bestowed upon other straits, this was designated the *Thracian Bosporus*. Both its south and north entrances have light-houses on either side. Its shores are elevated, and throughout its length the strait has on either side seven bays or gulfs, with corresponding promontories on the opposite side. One of these gulfs forms the harbour of Constantinople, or, as it is often called, the Golden Horn. Across the Golden Horn is Pera, and opposite the imperial city, on the other side of the Bosporus, is Scutari. The length of the Bosporus is about 17 miles, with a breadth of from little more than a third of a mile to two miles, and its average depth is about 30 fathoms. Both sides look highly picturesque from the deck of the steamers plying up and down the straits, being richly dotted with cypresses, laurels, and ancient plane-trees, and covered with palaces, kiosks, villages, villas, and gardens. At the middle of this strait, where it is about 2800 feet in breadth, Darius made his bridge of boats when he marched against the Scythians. The Bosporus having fallen under Turkish control, repeated European conferences, including that of Berlin in 1878, confirmed the stipulation of the treaty made in 1841 that no ship of war belonging to any nation but Turkey should pass through it without the consent of the Ottoman authorities. The Turkish peace treaty of 1920 placed both sides under international control, but failed to settle the question.

The CIMMERIAN BOSPORUS of the ancients was the Strait of Kaffa (q.v.), Yenikalé, or Theodosia. The country on both sides of the Cimmerian Bosporus formed, about 500 B.C., a kingdom which grew till it embraced the whole Crimea, and of which the capital was *Panticapæum*. Many of its kings were in close alliance with the Athenians, but it at length became tributary to the Scythians.

Bosquet, PIERRE FRANÇOIS JOSEPH, French marshal, born 8th November 1810, at Mont de Marsan, in Landes; entered in 1834 the Algerian army, and reached the rank of general of brigade

in 1848. In the Crimean war, he contributed greatly to the victories of Alma and Inkermann, and took a leading part in the capture of the Malakoff, where he was severely wounded. Made senator and field-marshal in 1856, he died 5th February 1861.

Boss, in Architecture, a raised ornament, covering the intersections of the ribs of ceilings. They



Boss.—From Notre-dame la Riche, Tours.

are more frequently seen in vaulted roofs, as in the aisles of a church, but occur also where the ceiling is flat. In early Norman work there are generally no bosses, and they become richer and more frequent as we advance towards the Decorated and Perpendicular styles. In the Decorated style the boss usually consists of foliage, sometimes combined with animals, heads, and the like. Coats-of-arms, charged with armorial bearings, came then also to be used for this purpose, though they were more frequent in the Perpendicular.—The boss of a bit is the ornament with which a bridle-bit terminates at each end. It was borne in the arms of the corporation of Lorimers. See LORIMER.

Boss, a modified form of the Dutch *baas*, 'master,' is used in the United States for an employer of labour, or a local political chief; and in Britain is a slang word, or is employed humorously. To 'boss' is to play the master. See TAMMANY SOCIETY.

Bossuet, JACQUES BÉNIGNE, the greatest of French pulpit orators, was born at Dijon on the 27th September 1627, of a middle-class family. He was educated in the Jesuits' School in Dijon, and at the Collège de Navarre in Paris. He received a canonry at Metz in 1652, and soon afterwards earned distinction as a controversialist by a reply to a work of the Protestant divine, Paul Ferri. In 1661 he preached for the first time in the chapel of the Louvre before Louis XIV., who was so impressed by the discourse, that he wrote to Bossuet's father congratulating him upon having such a son. Bossuet remained at Paris until 1669. His reputation as an orator spread over France, and he became the recognised chief of the devout party at court. After holding for a short time the bishopric of Condom, he was appointed tutor to the Dauphin, for whose benefit he is said to have written his *Discours sur l'Histoire Universelle* (1679). In 1680 he was elected to the academy, and in 1681 he received the bishopric of Meaux. He took a leading part in the Gallican controversy. His *Exposition de la Doctrine de l'Eglise Catholique sur les Matières de Controverse*—in which he advocated the royal as opposed to the papal claims—was adopted by the assembly of the French clergy held in 1682. He was less fortunate in his controversy with Fénelon, whose mysticism he regarded as heretical, and whom he attacked with an excessive violence, in strong contrast to the quiet and telling irony of his adversary's reply. The king, however, and ultimately the pope, supported Bossuet. He was made a member of the Council of State in 1697,

and first almoner to the Duchess of Burgundy in 1698. He died at Paris on the 16th April 1704. Bossuet's character is not an attractive one, though he made some protest against the king's licentiousness, oppressions, and unjust wars. As a preacher he had neither the outspoken courage of Bourdaloue, nor the persuasive gift of Massillon. His greatest works are the *Histoire Universelle*, regarded by many as the first attempt at a philosophy of history, and the *Oraisons Funèbres*, discourses on the death of the two Henriettas of England, of Condé, of Turenne, and of the Princess Palatine. Their chief characteristics are the splendour of the diction and the sustained flight of the rhetoric. While their author cannot be classed among great original thinkers, he is not a mere weaver of eloquent words. Intense religious conviction and deep knowledge of human nature give fervour and weight to his imposing sentences. As a controversialist, he combines, when at his best, the energy of enthusiasm with great dialectic ability; grasping his subject firmly, and showing remarkable wealth and felicity of allusion and metaphor. His chief controversial work is the *Histoire des Variations des Églises Protestantes* (1688). Bossuet was also the author of *Maximes sur la Comédie*; *Conférence avec le Ministre Claude* (1678); *Négociations avec Leibnitz* (1691); *De l'État Présent de l'Eglise*; *Sur la Morale Relâchée*; *Mémoires présentés à Louis XIV.* (1700); *Politique Tirée de Sainte Ecriture*, in which he upholds the divine right of kings (1709). He was admitted to the Academy in 1671.—JACQUES BÉNIGNE BOSSUET, nephew of the above, was born in 1644. He became Bishop of Troyes, where he died, 12th July 1743. He left a voluminous correspondence, dealing mainly with the controversy between his uncle and Fénelon.

The standard edition of Bossuet's works (1862-96) extends to 37 volumes. There is an edition of his *Correspondance* by Urbain and Levesque (1909 et seq.). See the *Mémoires et Journal* by his secretary, Lédieu; and *Lives* by Bausset (1814), Réaume (1870), Lanson (1891), Mrs Sidney Lear (1881), and Miss E. K. Sanders (1921); studies by Rébellian (1900, 1909), Brunetière (1913), Dinnet (1918); and Verlaque's *Bibliographie* (1908).

Bossut, CHARLES, mathematician, born at Tartaras, near Lyons, 11th August 1730, was furthered in his early studies by Clairaut and D'Alembert, and was, from 1752 till the Revolution, professor at Mézières, and under the empire in the Polytechnic Schools at Paris, where he died, 14th January 1814. In the compulsory retirement that followed the Revolution he wrote his famous *Essai sur l'Histoire Générale des Mathématiques*. He edited Pascal's works (5 vols. 1779).

Boston, a municipal and, till 1918, parliamentary borough and seaport in Lincolnshire, on the Witham, 30 miles SE. of Lincoln, and 107 miles NE. of London, by rail. Its name is a contraction of 'Botolph's town,' and it is commonly supposed to occupy the site of the Benedictine abbey founded on the Witham by St Botolph in 654, and destroyed in 870 by the Danes. Under the Normans, Boston became a place of importance, and in 1204 it paid the largest dues (£780) of any English port but London (£836). In the reign of Edward III. many foreign traders settled, and the merchants of the Hanseatic League established a guild in Boston. After their departure, the town declined, and the suppression of the monasteries by Henry VIII. further injured it; but his grant of a charter of incorporation, and Mary's subsequent grant of extensive lands, partly compensated for this. The modern town consists chiefly of four good streets, two on either side of the river, here crossed by a handsome bridge. The parish church of St Botolph measures 233 by 99 feet, and is one of the largest without transepts

in England. The tower is 263 feet high; it is in the Perpendicular style of architecture, and terminates in an octagonal lantern, doubtless intended



St Botolph's Church, Boston.

for a lighthouse by land and by sea, as well as a campanile, and by all the district, as seen rising above everything for miles around, is known as 'The Stump.' The founder's chapel is in the Early Decorated style of Edward II. (1307), and the nave, aisles, and the western part of the chancel are of the Late Decorated, Edward III. In 1843 the restoration of the church was commenced, the works continuing ten years, and over £10,000 being expended. A chapel to the memory of the Rev. Thomas Cotton, at one time vicar of Boston, was erected at the expense of the inhabitants of the daughter-city of Boston in America. A promenade by the river is tastefully laid out, with a people's park, public gardens, and recreation ground adjoining. Boston has also a free grammar, charity, national, and other schools, a guildhall, covered markets for fish, fowls, butter and eggs, a working-men's college, and school of art. The clearing of the river of silt, the formation of a new channel, and the opening of a corporation dock (1880-90) greatly promoted trade. There is a fleet of trawlers belonging to the town, and shipping lines to Hull, London, and Hamburg. The river and canals furnish communication with Lincoln and other towns. Boston is a great market for cattle and sheep, and has manufactures of agricultural implements, canvas, sail-cloth, ropes, sacking, beer, iron, brass, leather, with some shipbuilding. The chief exports are agricultural implements, coal, corn, and wool; and the imports consist of timber, pit-props, maize, cotton-seed, and general merchandise. Foxe the martyrologist, Conington, Jean Ingelow, J. W. Marston, and Ingram, founder of the *Illustrated London News*, were natives of Boston. Pop. of municipal borough (1851) 14,733; (1911) 16,673; (1921) 16,100. See the history by Thompson (1856), the *Victoria History of Lincolnshire* (1904-6), and *The Parish Registers of Boston*, ed. C. W. Foster (Lincoln Record Society, 1914-15).

Boston, the capital of Massachusetts, the county seat of Suffolk county, and one of the chief cities of the United States, is situated on an inlet of Massachusetts Bay, called Boston Harbour, at the mouths of the Charles and Mystic rivers, in $42^{\circ} 21' 27''$ N. lat., $71^{\circ} 3' 30''$ W. long., and 234 miles N.E. of New York by rail.

Boston possesses an excellent harbour, protected by several forts, and covering 75 sq. m., with a minimum depth of 35 feet at low tide, and is in all respects favourably situated both for foreign commerce and coasting-trade; the harbour has four fine lighthouses, and is dotted with more than fifty islands, on some of which hospitals have been built. A whole series of lines of railway converge at this city, in the outskirts of which the Junction Railroad connects most of the lines with one another; and some ten or a dozen recognised lines of ocean-steamers ply regularly to foreign ports. The chief imports are wool and woollen manufactures, hides and skins, leather and leather manufactures, cotton and cotton manufactures, iron and steel; the chief exports, meat and dairy products, wool, iron and steel manufactures, cotton, leather manufactures, and bread-stuffs. Boston is the principal wool market in the United States, and second only to New York in the value of its foreign trade. The city, besides being the seat of many varied local manufactures, is the headquarters of heavy railroad, mining, and insurance interests, the active operations of which are carried on in all sections of the United States. Charlestown government navy yard is within the present limits of Boston; Dorchester, Hyde Park, Roxbury, West Roxbury, and Brighton are also within the boundary; and the cities and towns of Cambridge (q.v.), Newton, Brookline, Revere, Winthrop, Somerville, and Chelsea are practically suburbs.

Boston is exposed to east winds, and pulmonary complaints are very prevalent; but otherwise its



Map of Boston and Vicinity.

climate is healthy. It is one of the best built cities in the United States, prominent among its specimens of elaborate architecture being Trinity Church and the Roman Catholic cathedral, the former erected at a cost of \$750,000, and said to be the finest church in New England. The streets in the older portion of the city, once singularly irregular in their course, have been very generally straightened, at great expense, and most of the principal ones are traversed by tramways,

which extend for many miles, connecting with suburban towns. An extensive system of elevated railways, opened in 1901, and a subway (cost \$4,350,000) relieve the traffic of the streets. The older buildings include the State-house (1795), with a conspicuous gilded dome, and fronting on the well-kept Common, the Old State-house (1748), Old South Church (1729), Faneuil Hall (1743), afterwards termed 'The Cradle of Liberty,' and King's Chapel (1754). Among later public buildings and institutions may be noted Tremont Temple, the headquarters of New England Baptists, containing an audience-hall, with seats for 2600, and a fine organ; the Free Public Library, with a million bound volumes, accessible to all comers; the government Post-office and Sub-treasury building, of granite, erected at a cost of about \$6,000,000; the Lowell Institute, for the support of free public lectures; the Massachusetts City, and several minor hospitals; a large number of homes, asylums, and orphanages, under the charge of the various religious denominations; and city dispensaries and institutions for the insane, the blind, &c.

Boston is one of the chief educational and literary centres of the United States. Its elaborate system of public schools embraces a large number of high schools, normal and Latin schools, grammar and primary schools, and kindergartens. The Latin School, founded in 1635, and the English High School are the largest in the country. A regular system of free lectures on a wide variety of subjects also exists, and large sums of money are expended annually for school purposes. Among the higher institutions of learning are the Boston College (Catholic); the Boston University (Methodist), for the education of both sexes; schools of technology and industrial science; three conservatories of music, of high repute; schools of law and divinity; and the Harvard Medical and Dental Schools, connected with Harvard University, which, though located in the adjacent city of Cambridge, is virtually a Boston institution.

The 'Hub of the Universe' has long been noted for the interest taken by its citizens in literature, science, and art. The city possesses a large number of literary, musical, and kindred associations, many of them incorporated and endowed, besides a number of social and political clubs. A recently developed and extensive series of public parks, extending in the aggregate to over 3600 acres, adds greatly to the amenity of the city.

Originally founded in 1630 upon a peninsula known as Shawmut, it was first called Trimountain, from the three hills which were then a marked feature of the territory, and was afterwards officially named Boston, after Boston in Lincolnshire, the native place of some of the principal colonists. This tract, purchased from the original settler, William Blaxton (or Blackstone), for £30, comprised 783 acres; but by successive additions the territory of the city has been increased, until, in 1888, it covered nearly 37 sq. m., and in 1922 nearly 48 sq. m. Among these additions are comprised the city of Roxbury, annexed in 1867; Dorchester, annexed in 1869; and Charlestown, West Roxbury, and Brighton, annexed in 1873. Charlestown had in 1870 a population of 28,000. Large tracts of ground

also have been reclaimed from the harbour and its branches, and sixteen bridges, besides the railway-



Trinity Church, Boston.

(From a Photograph by H. G. Peabody, Boston.)

bridges and steam-ferries, connect the city with its suburbs.

Boston has been identified with many events of general interest to Americans, such as the meeting of the first grand jury (1635), and the publication of the first regular newspaper (1704). The stern, impatient Puritan spirit of its founders led to the banishment of heretics and the execution of Quakers and witches, and later, to the expulsion of James II.'s officials. The conspicuous part borne by the town in the early troubles with England brought about the 'Boston Massacre' of 1770, in which several people were killed by the fire of the soldiery; and after the destruction of the British-taxed tea in the harbour (1773), the port was practically closed, and the town occupied by a British force, which, in March 1776, was finally compelled to evacuate the place (see BUNKER HILL). From 1830 to 1860 Boston was the headquarters of the movement for the suppression of slavery, against which its citizens had shown a strong feeling as early as 1645. The city has suffered from several destructive conflagrations, that of 1872 having been exceeded in the United States in the extent of the calamity only by the Chicago fire (1871).

Boston was the birthplace of Franklin, Copley the painter, his son Lord Lyndhurst, Poe, Emerson, Ticknor, Sumner, and Parkman, as Cambridge was of Holmes and Lowell; while associated with it and Cambridge have been Hawthorne, Longfellow, Agassiz, Whittier, Motley, Bancroft, Prescott, Channing, Theodore Parker, Dana, Margaret Fuller, Thoreau, Aldrich, the Alcotts, Jameses, and Howells. Pop. (1800) 24,937; (1840) 93,383; (1860) 177,840; (1880) 362,839; (1900) 560,892; (1920) 748,060 (Hyde Park town being annexed meanwhile). Besides the suburbs already named are South Boston and (on Noddle's Island) East Boston. See the history of what Howells has called 'the American Athens,' by Winsor (1880-82); and *Boston, the Place and People*, by M. A. de Wolfe Howe (1903).

Boston, THOMAS, born at Duns, Berwickshire, 17th March 1676, was the son of a father imprisoned for nonconformity. He attended Duns grammar school, and in 1691 entered the university of Edinburgh. He received licence as a preacher

in 1697, and was greatly appreciated by the serious portion of the community; but his uncompromising character prevented him from receiving a clerical charge for two years. As he puts it in his autobiography, he was, 'through the mercy of God, generally acceptable to the people, but could never fall into the good graces of those who had the stroke in the settling of parishes.' At length, in 1699, he was ordained minister of Simprin, Berwickshire, and in 1707 was translated to Ettrick, in Selkirkshire, where he died on the 20th May 1732. Of his works the one by which he was best known is the *Fourfold State*, published in 1720. It discourses of human nature in its fourfold state of primitive integrity (in Eden), entire depravity (by the fall), recovery begun on earth, and happiness or misery consummate hereafter. This work went through many editions, and was long recognised as a standard exposition of Calvinistic theology. *The Crook in the Lot* was a little book of a more attractive character, written in quaint and striking style. This book and his autobiographical *Memoirs* (the latter not published till 1776) were great favourites with the Scottish peasantry; R. L. Stevenson said that of his masters in style, Boston had influenced him most. As a pastor, Boston was eminently laborious and deservedly popular. In the ecclesiastical courts he distinguished himself by his zeal in defence of the church's independence, and in the controversy regarding the *Marrow of Modern Divinity* (which was objected to as being too free in its offers of salvation) he was one of the ten ministers who declared their approval of that work (see MARROW CONTROVERSY). As a theologian, Boston had a marked influence upon his own and succeeding generations. His language, sentiments, and characteristic modes of expressing the peculiarities of Calvinistic psychology, have coloured the style of Scottish preaching more than have those of any other writer of the same school. Although often displaying what we should now call narrowness, Boston exhibits also flashes of insight and beauty, quaint felicities of diction—as, for instance, when in *The Crook in the Lot* he warns the profligate against the possibility of a 'leap out of Delilah's lap into Abraham's bosom'—and shrewdness of thought. See the *Life* by Thomson (1895), and Morrison's edition of the *Memoirs* (1899).

Boswell, JAMES, immortal as the companion and biographer of Dr Johnson, was born at Edinburgh, 18th October 1740. He was the eldest son of Lord Auchinleck, a judge in the Court of Session, who had taken his title from an estate in Ayrshire, which had belonged to the family since the reign of James IV. He had his education at the Edinburgh High School and at the universities of Edinburgh and Glasgow, but his impressionable nature and characteristic love of such distractions and dissipations as were available showed themselves early, and caused much dissatisfaction to the surly but shrewd old judge. A year in London at twenty spoiled him for ever for a provincial. That restless itch for writing, which was yet to lead him so far, made him, a boy of eighteen, keep an 'exact journal,' write poems and prologues to Edinburgh plays, and publish, at twenty-three, a series of would-be clever and witty letters that had passed between himself and a companion of equal age and experience. His capacity for making friends and for falling temporarily in love, and his eagerness to know people that were notorious for anything, were as deep-rooted in his nature as his love of letters and literary distinctions. During his second visit to London he had the supreme happiness to make the acquaintance of Dr Johnson in the back-parlour of Tom Davies's shop in Russell Street (May 16, 1763). The sincerity of the disciple's respect seems to have touched the

master's heart, and the acquaintance quickly ripened into a warm friendship, which stood the strain of many a brutal rebuff on Johnson's part, and was kept in repair by frequent letters on both sides throughout the rest of Johnson's life. A few months later Dr Johnson accompanied Boswell to Harwich, on his journey to study civil law at Utrecht, and parted from him with counsels to be studious and steady, and many expressions of warm affection. At Utrecht Boswell spent one winter between study and dissipation, on an allowance from his father of £240 a year; after which, instead of returning home, he proceeded on a tour through Germany, Switzerland, and Italy, making on the way, with his usual assiduity, the acquaintance of Voltaire and Rousseau. The latter gave him a letter of introduction to Paoli, and to that hero the indefatigable Boswell at once repaired. He was well received by the Corsicans, and for a time played the great Englishman to his heart's content, not forgetting the while to ask Paoli 'a thousand questions with regard to the most minute and private circumstances of his life.' Soon after his return he was admitted advocate (July 1766), and seems to have had some little professional success, and to have employed himself voluntarily at least in the last stages of the famous Douglas cause. His *Account of Corsica* appeared early in 1768, and had great success. Johnson said the journal was 'in a very high degree delightful and curious,' but the poet Gray, whose eyes were undimmed by the partiality of friendship, called it, in a letter to Horace Walpole, 'a dialogue between a green goose and a hero.' Early in 1767 Boswell waited upon Chatham in Corsican costume to plead for Paoli, and was honoured some time after by a warm letter from the great statesman, which encouraged him in reply to the characteristic temerity of asking, 'Could your lordship find time to honour me now and then with a letter? To correspond with a Paoli and with a Chatham is enough to keep a young man ever ardent in the pursuit of virtuous fame.' From this time Boswell's mind was much taken up with a succession of matrimonial schemes, which ended somewhat prosaically with his marriage, in November 1769, to his cousin, Margaret Montgomery, a prudent and amiable woman, who bore him seven children, and who proved herself a sensible and forgiving wife. On the same day his father married a cousin of his own, to the son's disgust and alarm. The old judge allowed his son £300 a year, and from time to time paid his debts for him, but not without much grumbling and many threats. Boswell never became a prosperous lawyer, and continued to make visits to London almost every year. In April 1773, fortunately for the world, but against the wishes of many of the members, he was elected, through Johnson's influence, a member of the famous Literary Club. Later in the same year occurred the memorable journey to the Hebrides. Neither the old judge nor Boswell's own wife could understand the enthusiasm for the uncouth-looking philosopher, and although the latter was studiously polite, she could not hide from the astute Johnson the fact that he was disliked. In 1775 Boswell began to keep his terms at the Inner Temple, and was ultimately called to the English bar in 1786; in 1776 the Auchinleck property was entailed upon him; and in the August of 1782 he succeeded, on his father's death, to an estate of £1600 a year. His last meeting with Johnson was at a dinner at Sir Joshua Reynolds's early in 1784, the year towards the close of which Johnson died. Croker calculated that Boswell met Johnson in all on 180 days, or 276 including the Scotch tour. Boswell now made some attempts to enter on a political career, for some years entertained hopes from the

patronage of Lord Lonsdale, and could not understand Pitt's 'utter folly' in not seeing the value of 'my popular and pleasant talents;' but his sole reward was the recordership of Carlisle, which he resigned in a year, through resentment of his patron's treatment of him. In 1789 his wife died, and henceforward his drinking habits gained the better of him more completely. But indeed he had been drinking all his days, with fits of repentance and solemn promises of amendment between. From his drunkard's hypochondria and the pressure of difficulties for money he found refuge in the preparation of his life of Johnson, which occupied him several years. Spite of occasional despondency and the pinch of financial difficulty, he refused to part with the copyright, and his confidence was justified. The book appeared in the May of 1791, was received with delight, and sold rapidly. A second edition was issued in July 1793. But his success failed to lift him out of his gloom and intemperance, and his health began to give way. He died in London, after a brief illness, 19th May 1795.

Boswell's *Life of Johnson* is admittedly our greatest biography, and the remarkable merit of the book has led many to wonder how it could possibly have been written by a man of such egregious weakness and vanity as Boswell. Indeed, Macaulay advanced the preposterous paradox that it was because of his unrivalled qualities as a fool that its author had written the best life in existence. The true explanation, however, is that this vanity and folly by no means made up the whole mental equipment of Boswell, and that these unenviable qualities in his character have merely become so conspicuous because he had so much less reticence than ordinary men. The man who could retain the friendship of Samuel Johnson, and who could be described as 'the best travelling companion in the world,' was something more than a parasite and a fool. Nor could the most veracious fool have written such a dexterously artistic book. But it should be remembered that Boswell's Johnson is the real Johnson only so far as Boswell understood the soul of the English moralist; we cannot believe that the biographer realised the deeply religious side of Johnson's nature. The portrait may be true so far as it goes, but for the complete Johnson we must seek and find him in his own works. He gives us the most vivid dramatic pictures by a few simple but subtle strokes; this is not the work of memory nearly so much as of artistic reproduction. This noisy, ugly, vain, foolish, drunken Scottish lawyer and laird, 'the buffoon of genius,' had in him something of the true Shakespearian secret.

The great standard editions of Boswell's great work are those by Napier (1884) and by Dr Birkbeck Hill (6 vols. 1887), Boswell's letters to his lifelong friend Temple (1856; ed. Seccombe, 1908), and *Boswelliana* (1874) by Charles Rogers. The famous essays by Macaulay and Carlyle contradict rather than correct each other; but the latter has much more truth in it than the former. There is a *Life* by Percy Fitzgerald (1891), who in *Boswell's Autobiography* (1912) argues that the *Johnson* is really Boswell's life by Boswell; also a book by Leask (1897), one by George Mallory (1912), and Professor Chauncey B. Tinker's *Young Boswell* (1922). See also the books named at JOHNSON. Sir Walter Raleigh says he was 'a greater man than Macaulay.'

Boswell's eldest son, ALEXANDER, was born at Auchinleck in 1775, and educated along with his younger brother James at Westminster and Oxford. He settled at Auchinleck, and set up here a private press, at which he printed many rare books in early English and Scottish literature. He had all his father's industry and love of letters, and published many volumes of more or less meritorious verse. Already, in 1803, he had printed a volume of vigorous poems in the Ayrshire dialect,

and in 1817 he contributed twelve songs to Thomson's *Select Collection of Original Scottish Airs*, of which 'Good-night, and joy be wi' ye a', 'Jenny's Baubee,' and 'Jenny dang the Weaver' are still popular. A devoted admirer of Burns, Boswell raised by his exertions £2000 for the monument on the banks of the Doon. He was created a baronet in 1821 for a loyal song, 'Long live George the Fourth.' He died at Balmuto in Fife, 27th March 1822, of a wound received the day before in his duel with James Stuart of Dunearn, who had challenged him as the author of some anonymous political pasquinades.—JAMES BOSWELL, his younger brother, was born in 1778. He early became intimate with Malone, and assisted him in his Shakespeare work. His name is now known chiefly to Shakespeare scholars as the editor of what is known as the third *Variorum Shakespeare* (21 vols. 1821). He died suddenly at his chambers in the Temple, February 24, 1822.

Boswellia, a genus of Burseraceæ, of which the species are still very imperfectly known, although the product of some of them—Olibanum (q.v.), generally believed to have been the Frankincense (q.v.) of the ancients—has long been of considerable commercial importance for the preparation of incense. The most important species appears to be *B. carteri*, but several other species or varieties have been described from the same region (Southern Arabia and Eastern Africa, near Cape Guardafui). *B. thurifera* or *serrata* of Coromandel yields a soft fragrant incense-resin, which is not true olibanum; and the closely allied *B. glabra* also yields a comparatively coarse resin, sometimes used as incense, but also boiled with oil as a substitute for pitch. The Abyssinian *B. papyrifera* (so called from its laminated paper-yielding bast) also yields an olibanum, but it is not collected.

Bosworth, or MARKET BOSWORTH, a small market-town in Leicestershire, 12 miles W. by S. of Leicester. On a moor 2 miles to the south was fought (1485) the battle in which Richard III. was slain, and which terminated the Wars of the Roses. On an elevation, called Crownhill, Lord Stanley placed the crown on the head of the Earl of Richmond, Henry VII. Simpson the mathematician was a native, and Dr Johnson was an usher in the grammar-school.

Bosworth, JOSEPH, D.D., an Anglo-Saxon scholar, was born in Derbyshire, in 1789, and educated at Repton, Aberdeen, and Trinity College, Cambridge. Presented in 1817 to the vicarage of Little Horwood, Buckinghamshire, he devoted all his spare time to literature, and especially to researches in Anglo-Saxon. The result of his labours appeared in his *Elements of Anglo-Saxon Grammar* (1823), and a *Dictionary of the Anglo-Saxon Language* (1838), his *magnum opus*, a new edition of which, by Professor Toller, has been issued from the Clarendon Press since 1882. Bosworth resided as British chaplain in Holland from 1829 to 1840, when he obtained the vicarage of Waithe, in Lincolnshire, in 1857 becoming rector of Water Stratford, Buckinghamshire, and in 1858 professor of Anglo-Saxon at the university of Oxford. He gave £10,000 towards the establishment of a professorship of Anglo-Saxon at Cambridge, having, according to his own statement, realised £18,000 by the sale of his works. He died 27th May 1876.

Bosworth, WILLIAM, poet, was born in 1607 of the family of Bosworth or Boxworth, of Boxworth in Cambridgeshire. Of his life little or nothing is known. He seems to have died in 1650. Next year one R. C. published a volume entitled *The Chast and Lost Lovers lively shadowed in the persons of Arcadius and Sepha*. The contents of this book, one long poem and a few shorter

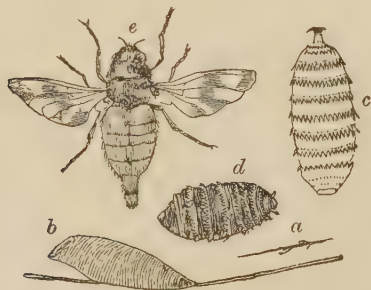
ones, are said to have been written by Bosworth at the age of nineteen, and there is a hint that more may follow; but no more seems to be extant. Bosworth's poetry is pleasing, not without promise. It follows the older Elizabethan rather than the contemporary manner. See Saintsbury's *Caroline Poets* (ii. 1906).

Böszörmény, two towns of Hungary: (1) Hajdú-Böszörmény, 12 miles NNW. of Debreczen, in a corn and cattle district; pop. 30,000. (2) Bereg-Böszörmény, a small town 33 miles SSE. of Debreczen; pop. 5000.

Bot, Bot-fly, Gad-fly, and Warble-fly, names common to many insects of the family *Estridæ*, the genus *Estrus* of Linnaeus. The name bot is sometimes restricted to the parasitic and destructive larvæ. This appears to have been its original use, the other names being given to the perfect adults, and the name gad-fly often to blood-sucking insects of the very different genus *Tabanus* (q. v.), to which some try to restrict it. The insects of this family are now supposed not to be those which were called *Estrus* by the ancients, although, like them, extremely troublesome to cattle. They are dipterous (two-winged) insects (see *DIPTERA*), nearly allied to the *Muscides* (House-fly, Flesh-fly, Blow-fly, &c.).

The head is large, and as if blown out; the antennæ are short and spring from deep pits; the proboscis and palps are degenerate; the eyes are small, and there are three eye-spots; the posterior part of the body is rounded; the hindmost legs are often very long. The larvæ have toothed body-rings, and are parasitic in the nose, throat, stomach, or under the skin of mammals, and are unfortunately more familiar than the bee-like adults.

(1) The Horse-bot, or Gad-fly of the Horse (*Gasterophilus*, or *Gastus* or *Estrus equi*), sometimes also called the Breeze and Horse-bee, is much less common in Britain than in some parts of the continent of Europe, and occurs chiefly in elevated heathy districts. It is not quite half an inch in length, woolly, with yellowish-gray head, rusty thorax and abdomen, and whitish wings, with brownish-gray spots. The abdomen of the female



Horse Bot-fly:

a, a horse-hair with eggs of bot-fly; b, one egg magnified; c, larva; d, pupa; e, perfect insect female, a little larger than life.

ends in a black horny egg-laying tube. In the later part of summer the female hovers about horses, and deposits her eggs on their hairs, where they remain attached by a glutinous substance, until they, or the larvæ just emerging from them, are licked off by the tongue of the horse, their destined place being its stomach. It is believed that the fly deposits her eggs only on those parts which are accessible to the horse's tongue, seeming to prefer the back of the knee-joint, where they may sometimes be found in hundreds. The larva is yellowish, without feet, short, thick, soft, composed of rings which have a double row of short

teeth surrounding them; it is somewhat sharply pointed at one end—the head; and the mouth is furnished with two hooks, one on each side, for taking hold of the inner coat of the horse's stomach, to which the bot attaches itself, and from which it derives its subsistence, hanging in clusters sometimes of three or four, sometimes of more than one hundred. Here it spends the winter, and in the following summer, when it is about an inch long, it disengages itself, and being carried through the horse's intestines, burrows in the ground, and changes into an oval black pupa with spiny rings, from which, in a few weeks, the perfect insect comes forth. Multitudes, of course, become the prey of birds before they can accomplish their burrowing. It has been disputed whether or not bots are very injurious to horses; and some have with apparent improbability maintained that, when not excessively numerous, their presence is rather beneficial.—The red-tailed Horse-bot (*G. hæmorrhoidalis*), also a British species, deposits its eggs upon the lips of the horse, distressing it very much by the annoyance which it gives in so doing. The larvæ attach themselves chiefly to the surface of the intestine and about the anus of the horse, and sometimes cause an annoying irritation. Linseed-oil is used for their removal. *G. nasalus* also finds its way into the stomach, more frequently the small intestine, of the horse.

(2) The Ox-bot or Warble-fly (*Hypoderma*) causes 'warbles' in cattle. The common English species is *H. lineata*; the common Irish one is *H. bovis*. The handsome bee-like flies are commonest at the height of summer, and, though they do not sting or bite, they cause much excitement among the



Ox Bot-fly:

a, larva, full grown, natural size; b, pupa; c, perfect insect, a little larger than life.

cattle. The females lay their eggs near the head or shoulders, and perhaps exceptionally on the back. It is believed by some that the eggs are usually laid on the back, that the larvæ are hatched there, and that they bore their way directly below the skin of the back, where the warbles mostly occur. The facts seem to indicate a more circuitous path, for the larvæ are found far inside the animal in many places between the gullet and the back. It is likely that the larvæ are licked in by the cattle, as in the case of horse-bots, and that there is a slow internal migration. Eventually, in any case, the larvæ come to rest in abscesses below the skin, each with an air-hole to the surface. In May or June of the next year they wriggle out, and pupate on the ground. The flies emerge in about seven weeks. The damage done by these parasites is threefold: the warbles spoil the hides; the flesh is condemned as 'licked beef'; the cattle go out of condition. As the flies love the sun, it is important that the cattle should have access to shade and water. As a preventive, the hocks, &c., are sometimes dressed with paraffin and the like. The larvæ should be squeezed out and destroyed in spring, or smothered with M'Dougall's smear or greasy matter.

(3) The Sheep-bot (*Estrus* or *Cephalomyia ovis*) is a much more serious pest than any other British species, and is not infrequently very destructive to

flocks. The insect is smaller than either the ox-bot or horse-bot, is of a yellowish-gray colour, with a large head and yellow face, and is most abundant in damp situations and woody districts. It is to be seen chiefly in the months of June and



Sheep Bot-fly (*Estrus ovis*):

a, larva from above; b and c, the same seen from in front and from behind; d, adult insect.

July. Sheep exhibit great alarm when it approaches them, and seem to seek, by keeping their noses close to the ground, and by incessant motion of their feet, to keep it from entering their nostrils. It is in the nostrils of the sheep that this fly deposits its eggs, and the larvæ, when hatched, make their way into the maxillary and frontal sinuses, feeding upon the juices there, until they are ready to change into the pupa state, in April or May of the following year, when they find their way again through the nostrils to the ground. They seem to cause great irritation in their progress up the nostrils of the sheep, and the poor animals run hither and thither, snorting and in great excitement. 'The common saying, that a whimsical person is *maggoty*, or has got *maggots in his head*, perhaps arose from the freaks the sheep have been observed to exhibit when infested by their bots.' The bots cause considerable irritation in the cavities where they usually fix themselves, and sometimes getting into the brain cause death.—These larvæ move with considerable quickness, holding on by the hooks with which their mouth is furnished, and contracting and elongating the body. It is said that flocks fed where broom is in flower are never infested with them; and when many cases arise in a flock, removal to a dry soil is found particularly advantageous.

These three genera, with their three modes of parasitism, do not complete the list of bot-flies; *Cephenomyia* and *Pharyngomyia* are two others with several species infesting, in their larval state, deer, goats, and other hoofed mammals. Elephants are also afflicted; and *Cuterebra* deposits its eggs under the skin of hares and the like. The eggs of one of the species which attacks the fallow-deer are deposited in the nostrils, and the larvæ make their way in large numbers to a cavity near the pharynx. Reindeer are excessively tormented by these insects, one kind depositing its eggs in their nostrils, and another in their skin; and it is no unfrequent thing for a large part of a flock to be destroyed by them. When feeding where bot-flies are numerous, they are said to keep such watch against them, that they neglect to eat, become emaciated, and often actually perish in consequence. Even human beings are said to be sometimes afflicted by insects of this family. Humboldt saw Indians in South America having the abdomen covered with tumours produced by their larvæ. They touch human life more certainly and disastrously in an indirect way by the injuries they inflict upon stock. Dairy and sheep farmers, and stock-keepers generally, not to speak of leather manufacturers, know well the disastrous work of these bot larvæ. 'The attack of warbles (alone) is now grown to be one causing enormous annual national loss, estimated by practical men at sums from two

million to seven million pounds sterling per annum, at the least, and there is no reason why we should suffer it to go on' (Miss Ormerod).

See Miss Ormerod's works on insect pests, and specifically on the ox bot-fly (1881-94); and Osborn's work (pub. by U.S. Agric. Dept. 1896).

Botallack is the name of a famous mine on the west coast of Cornwall, 8 m. N. of Land's End. The works are on the edge of the cliff; part of the underground workings (abandoned in 1875) extended 2448 feet beneath the sea. The mine was worked as a tin mine in 1721, in 1841 was famous as a very rich copper mine, and has subsequently been wrought for both or for one of those metals.

Botanical Geography. See GEOGRAPHICAL DISTRIBUTION OF PLANTS.

Botanic Garden. While ordinary gardens are concerned with utility or beauty only, the botanic garden has for its primary aim the promotion of botanical science, and is thus necessarily of comparatively modern origin (see BOTANY). Like the science itself, the botanic garden owes its birth to the needs of pharmacy; thus at the earliest European school of medicine, that of Salerno, we find record in 1309 of the medical garden of Matthæus Sylvaticus; while in 1333 a similar garden was established by the Republic of Venice. These private and public examples seem to have been more or less widely followed, yet the botanic garden in the modern sense is usually dated from a private one founded at Padua (between 1525 and 1533), from the public one of Pisa, established by Cosmo de' Medici in 1544, or from that of Padua, which dates from the following year, and was greatly enriched by its founders, the Signiory of Venice. The other great Italian cities soon followed this example, and a botanic garden was also founded at the university of Leyden in 1577, and at the universities of Montpellier, Leipzig, Breslau, and Heidelberg before the end of the century. At Paris, too, a royal garden was founded in 1597, but at first, it is said, only with the petty aim of varying the bouquets worn at court: in 1626, however, its scientific purposes were defined; in 1635 chairs of Botany and Pharmacology were founded, and it soon became famous as the *Jardin des Plantes*. The establishment of physic or botanic gardens continued during the 17th century, and those of Oxford (1632) Chelsea (1677), and Edinburgh (1680) may be particularly noted. A further impetus was given by the popularisation of botany in the last century by Linnaeus, and by the consequently increased importance of the subject as a branch of academic education: most European universities, including all German ones, have now their botanic gardens, as well as many purely commercial cities. The leading American universities and cities have also followed suit, the gardens of Philadelphia, New York, Cambridge, and St Louis being well known. Similar institutions, usually of more definitely economic aim, have been founded by the principal governments in their colonial dominions; those of Buitenzorg in Java, of Calcutta, and of Peradeniya in Ceylon, may be mentioned as of special importance. While almost every botanic garden boasts its own peculiar excellence, the comparatively modern establishment of Kew, founded in 1760, is reckoned the largest, richest, and most fully organised (except for teaching purposes) in the world; those of Paris, Berlin, Vienna, and Edinburgh may also be mentioned as each in certain respects claiming in the foremost rank.

The mode of arrangement of botanic gardens varies infinitely in detail, yet more or less faithfully reflects the state of scientific knowledge and of horticultural and general taste at the period

of its foundation or reconstruction; hence a scientific (but not always artistic) advantage of modern gardens. The Linnean system of arrangement has of course been replaced by the Natural, but in expressing this no two gardens agree. In some the principle of arranging plants according to their geographical distribution is also largely followed, while economic or medical interests have had a very variable share. The primeval and convenient separation of plants as trees, shrubs, perennial herbs, and annuals has also to be largely attended to; while the very varied origin of the collection, from all countries and climates, necessitates their disposition as nearly as possible in corresponding artificial climates and soils; and thus not only the rockery and alpine garden, the bog garden, and the pond are required beside the ordinary garden beds, but a series of greenhouses and hot-houses of different temperatures and sizes; the latter culminating in the gigantic palm-house. The best garden may be taken as that which best combines all these advantages, and reconciles them with the respective claims of simplicity and beauty; yet no garden can be considered as complete without its accompanying *hortus siccus* or herbarium, its museum, and its library, as well as its laboratories for research, and its lecture-rooms for teaching. It is concerned with the introduction of new plants and the exportation of others to new countries, and thus requires a colonial and international organisation of exchanges and correspondence. It forms a natural centre for the preparation of scientific travellers and the training of gardeners, arboriculturists, nurserymen, and florists; while it owes services both to medical and general education.

While for the full performance of all these varied functions the resources of a great botanic garden are never too ample, it is important to note in conclusion that many of these purposes, and particularly the educational one, can be largely reached upon an incomparably smaller scale. A 'type botanic garden,' illustrating all the more important natural orders of temperate climates, and therefore containing examples of the majority of the plants most important from the point of view alike of botany and medicine, of history, literature, and economics, can be made at altogether trifling expense, and within the narrowest limits. The establishment of such small popular gardens has been followed by the most beneficial results, and their adoption by public and private schools and other institutions is happily in active progress (see BOTANY). For the literature of botanic gardens, see Jackson's *Guide to the Literature of Botany*, pp. 405-453, and thereafter Just's *Botanischer Jahresbericht*.

Botanomancy. See DIVINATION.

Botany is that sub-science of biology which has for its special province the phenomena of the vegetable world. Its general origin and rise, its place among the sciences, its progress in morphological and physiological analysis, and its broadest generalisations, have thus been already outlined under BIOLOGY (q.v.); here it remains to give a sketch of the history of the special study of plants, an account of its present state, and an indication of the most direct and profitable way of approaching the subject. From this brief account the reader may therefore pass on the one hand to the major article BIOLOGY, with its subordinate general articles like MORPHOLOGY, PHYSIOLOGY, &c., and on the other to any of the numerous minor articles concerned with the details of the subject.

1. *History of Botany.*—The special history of the science may be very briefly outlined. Aristotle's treatise *On Plants*, if indeed it was Aristotle's, is

lost, but the writings survive of his pupil Theophrastus, who not only describes about 500 plants, but discusses the vegetable world with something of his master's philosophic spirit. The 1st century produced the *Materia Medica* of Dioscorides—in which 600 plants are named, 400 with descriptions—as well as the writings of the elder Pliny, which, however, contain no original matter, but are simply a compilation of literary and popular knowledge, chiefly with reference to practical uses. Although some knowledge of botany must have been conserved in the medical traditions of the following centuries, we hear nothing of botany until the time of Charlemagne, who was a hearty patron of gardening as well as agriculture. The early Greek knowledge of the subject found its way through the Herbal of Avicenna into Western Europe, and it is probably to this transmission that we owe the 13th-century work of Albertus Magnus, although this is a mere worthless commentary upon the classical writers already mentioned. The merit of initiating the independent observation of plants themselves is usually ascribed to Otto Brunfels of Strasburg, whose *Kraüterbuch* was published in 1537, three years after his death. Similar descriptive efforts followed with increasing rapidity during the remainder of this and the following century, to which period belong many botanists of honourable memory. Among these may be especially named, in Germany, Bock, Fuchs, and the brothers Bauhin; in Switzerland, Gesner; in the Netherlands, Dodonæus, Lobel, and Clusius; in France, Ruellius and Delechamps; in England, Turner; and in Italy, Cæsalpinus; while the rate and reality of progress may be judged from the fact that while Brunfels describes only 240 species, Bock has 800, Lobel 2191, and Bauhin (in 1623) 6000 species. Botanical travellers also arose, among whom Clusius in Europe and Albin in the east are especially remembered. Botanic Gardens (q.v.) next were founded, classificatory attempts were made with more and more frequency, and the advent of Linnæus was thus fully prepared for. The later portion of the 17th and beginning of the 18th century is also memorable for the fruitful application of the microscope to the study of plants by Malpighi (q.v.), whose discoveries were continued and extended by his English exponent Grew, as well as by the indefatigable enthusiasm and industry of Leeuwenhoek. The study of cryptogamic plants was thus rendered possible, and its initiation is ascribed to the labours of Micheli and Dillenius during the second quarter of the 18th century. The rise of Vegetable Physiology (q.v.) is also dated from the classic observations (1727) of Stephen Hales upon the movement and pressure of the sap.

The descriptive botanist still necessarily occupied by far the foremost place, especially as the progress of botanical travel was now passing the limits of Europe to bring home an indefinite variety of plant marvels from all the most distant countries. Many stately monographs thus date from the same pre-Linnean period, while the replacement of the crude and empirical classifications due to Cæsalpinus and other writers of the 16th century became increasingly hopeful as well as urgent. The classifications proposed by Morison, Ray, and Tournefort were especially of service, and will be considered at VEGETABLE KINGDOM. Under this head must also be discussed the epoch-making *Systema Naturæ* of Linnæus, as well as the various phases of that necessary replacement of his artificial method of larger grouping which has been in progress during the past hundred years. Although the foundation of the 'Natural System' is with

substantial justice assigned to the two De Jussieus (uncle and nephew), it must also be remembered that its essential principle—that affinities are to be determined not by any single character, but by the sum of all—had been more or less familiar to many of the earlier botanists, particularly to Ray, as certainly also to Linnæus himself. He in fact proposed his artificial system avowedly as provisional; and the blame of its obstinate and bigoted retention for well-nigh two generations after Linnæus and the elder De Jussieu had departed, must thus, as in so many other historic cases, be ascribed, not to the purpose of the master, but to the blind and indiscriminating reverence of his disciples in adhering to the letter of his writings at the expense of their general aim and spirit.

The story of this long and laborious indexing of the book of nature is an interesting tale. The wanderings of Clusius were repeated and outdone by the immediate scholars of Linnæus, a generation later by Humboldt, and again by the younger Hooker, with whom a new record of eminent collectors begins; and the story has in it an element of epic breadth, as becomes what is indeed the modern re-search after the golden apples. Nor should the patient complementary systematic toil, of which the colossal *Prodromus Systematis Naturalis*, the monument of three generations of De Candolles (Geneva, 20 vols. 1818-73), is only the central work, pass without recognition.

But it is a less favourable aspect of the progress of botany which forces itself on the student. From the petrifying predominance of letter over spirit, no science has indeed been wholly exempt. Yet happily, for the past century at least, no department of knowledge save botany has ever fallen into such utter intellectual torpor, lain in it so long, nay, indeed, even now escaped from it so incompletely. It was much certainly to have done with commentaries upon Dioscorides and Pliny, and again begun after an interregnum of fifty generations to gather fresh flowers and look at them in themselves; still, this return to nature was far less thorough than it seemed. For although the old herbalist's reference-book of dried simples gathered from the fields and woods around his town was growing into a vast herbarium of all the world, and although he had been suddenly raised into a position of high academic honour and influence, the unnoticed drawbacks of such apparently complete scientific success were neither few nor small. The best botanist was thus he who had described most plants and had accumulated the richest herbarium; but the art of describing plants, once clearly learned, became a mechanical routine, a mere Latin clerkship. The inventory done, the interest of the consignment of new plants was exhausted, or thereafter oscillated between the petty pride of priority and possession, and the exercise of the surviving commercial passions in incessant barter. In their new-won academic seats, the systematic botanists in fact speedily absorbed all the vices of the old-world pedantry around them. First, the simple descriptive language of Linnæus was elaborated into a barbarous terminology which he would have been the first to denounce; and the concrete teaching of the facts of botany became more and more pushed aside. The whole course of degeneration was in fact a curiously perfect outcome and reflection of the established course of general education, in which the abstractions of grammar, at first admitted as a preliminary aid to the study of literature, had finally come to exclude that study for the majority of learners altogether. Nor did these vices by any means wholly end with the victory of the Natural System; some residue of them is inseparable from all study of the subject on a purely morphological

basis. Linnæus and De Jussieu alike committed themselves to this, and that necessarily so far as their immediate problem was concerned (see BIOLOGY, § 3). They failed sufficiently to realise, or at anyrate to point out to their successors, what an abstraction from the realities of the living world is involved in looking at the plant from a primarily morphological point of view—in regarding it as a fixed and empirical phenomenon of pure form, which may be analysed and compared, named and classified, but admits of nothing more. Hence, while their followers rightly continued to avail themselves of this abstraction, which they found to yield a wealth of detailed results, they became unconsciously enslaved by it, and henceforth mistook for the sole method of botany what was really no more than the necessary artifice of its morphological department. They even unhappily lost sight of the central problem of their subject, that of interpreting the plant as a changing manifestation of *life*. It was much indeed to pass from the counting of the reproductive organs only with the Linnean systematist to that comparison and scrutiny of all which was initiated by De Jussieu, and hence to extend our knowledge to the cryptogamic world; and much also to discern with Goethe and succeeding morphologists the deep unity of principle which underlies the widest apparent varieties of form, and which has enabled us to reduce all organs to the simple categories of root, stem, leaf, and trichome or hair, and even to analyse these into their component tissues—epidermic, fundamental, and fibro-vascular; and finally most of all with the embryologist to describe all these forms as the final phases of a process of continuous development from unicellular to multicellular, general to special, simple to complex. In this way we at length reach a morphological conception of even the evolution of organic beings, as a kind of phantasmagoria in which the empirically known forms undergo a broadly similar individual and racial development, and in which individuals and species alike are constantly replacing or being replaced by others. Yet so long as our original standpoint is unaltered, our botany is one-sided; nay, our knowledge is not yet truly biological at all, for we are forgetting that it is the phenomenon of life which is the *differentia* of the science.

Here, then, it is that the real understanding of the subject must begin; our essential problem is to understand the life of the plant, to comprehend the sum of its functions, to answer first of all the questions natural to every healthy mind, whether child's or beginner's, and inquire what is the use to the plant of its root, stem, and leaves, its flower and fruit. To answer these questions rightly involves indeed at once all the preceding morphological inquiries, yet now in a new spirit; for these parts are no longer to be thought of as forms to be discussed by themselves, but as the result of the adaptations in the past and the present of the living being to its surroundings, of organism to environment, inside to outside. Some of these adaptations are active, enabling the plant to utilise its favourable conditions; others passive, to resist its unfavourable ones. Hence, whether we seek rationally to comprehend the history of botany, or its present state, or profitably to undertake its study, the physiological standpoint is the essential one. While recognising the importance and legitimacy of morphological inquiries, of description of general form, or of the study of organs, tissues, cells, and protoplasm (see BIOLOGY, § 3), we have distinctly to correlate and subordinate this sub-science to the physiological interpretation the mind is primarily seeking. Our biological science is a concrete and

dynamic, not an abstract and static one; its highest ideal is a synthetic view of functions and forms, and to this the analysis must be subservient.

Yet in the pre-Linnean, Linnean, and even post-Linnean period, the morphologists predominated almost exclusively: the discovery of the sexes of plants had indeed been made, but lay almost unutilised. Kölreuter might indeed experiment on the fertilisation of plants, and Sprengel exultantly publish his *Secret of Nature Discovered*, but these admirable labours were absolutely ignored until their repetition a century later by Darwin. The physiological investigations of Hales were similarly left uncontinued until comparatively recent times; and the yet more important line of discovery as to the function of leaves and their relation to the atmosphere initiated by Bonnet, Ingenhousz, and Senebier a century ago, seems to have met with similar indifference so far as professed botanists were concerned, although their transcendent physiological, chemical, and agricultural interest secured their continuance after Priestley by chemists like T. de Saussure and Boussingault.

The tendency towards recovery from this dry-as-dust character of the science can of course be traced in the writings of many botanists, especially after the time of Goethe. From faults of this order the 'Naturphilosophie,' of which Oken (q.v.) was the leading representative, certainly escaped. The peculiar extravagances of his speculations can only be explained as the violent reaction of an original but inaccurate mind of strong physiological bias, and his conspicuous failure to make any substantial contribution to science, and the natural repugnance of all the more exact although narrower minds around him to his baseless hypotheses, had a most disastrous effect in discouraging and postponing any trespass beyond the conventional lines of labour, or any progress to a fresher and more vital point of view. The developmental and physiological attitude was, however, much more effectively reasserted by Schleiden, whose *Principles of Botany* (1846) is full of a trenchant and perfervid criticism, in spirit and expression often curiously suggestive of Carlyle. His views gained great weight from his high histological and physiological position as the founder of the cell theory; and in no small measure through him progress in Germany henceforth became so rapid as soon to place that country in the van instead of the rear. Not only have the labours of cryptogamists like Hofmeister, Cohn, and De Bary been of wide influence, but great schools have arisen of vegetable physiology—e.g. those of Sachs and Schwendener. Since 1859, the commanding influence of Darwin has been steadily saturating botanical thought. It is to him (see BIOLOGY) that we owe the authoritative accomplishment of the change from the primarily analytic and static, or morphological view of the plant-world, to the dynamic or physiological one. Here, with the science centred no longer upon the herbarium specimen, but once more, as it were, upon the living dryad, this retrospective sketch of the progress of botany may fitly conclude, leaving further details to be sought for in the articles devoted to the lives of different botanists, and to special departments of the subject.

2. *Present State of the Science.*—While more and more influenced by the historic movement above outlined, the present state of botanical research presents many examples of work in all departments and aspects of the subject. Whole battalions of workers are busy upon each successively deepening plane of analysis (see BIOLOGY, § 3). Thus, although the age of great travellers is necessarily ended, the explorer still finds abundant gleanings in many parts of the world, and the

minor fungi and algæ will also long furnish an especially fertile field of systematic labour. The essential problems of the morphology of the higher plants may be said to be mainly solved; and though those presented by cryptogamic plants are less understood, the splendid generalisation which unifies the cryptogamic and phanerogamic plants as members of a single series must always remain the backbone of the subject. As respects tissue and cell, the progress of microscopic investigation is still yielding results of the highest importance, while the study of protoplasm is also rewarding an increasing number of workers. Physiology, as we have seen, is steadily acquiring its due predominance; indeed, the abundance of workers and of results demands a separate discussion. Here we may merely note how these workers fall into two main schools, one, long represented by Sachs, studying protoplasm and cell, tissue and organ, by help of all the resources of chemistry and physics; the other, of which Darwin was the head, concerned with the detailed interpretation of the adaptation of the plant to its mode of life, and with the history of its evolution. In this relation the studies of the botanical geographer and the palæontologist are also of special importance; and it is naturally from this evolutionary school that the synthetic impulse chiefly emanates which is now beginning to be felt in all departments.

The voluminous literature embodying the results of all these labours is published sometimes as of old in separate volumes; more frequently in the proceedings of learned societies; but oftener in special journals too numerous for mention, of which the *Botanische Zeitung* and *Bot. Anzeiger* may occupy a foremost place. Of this copious outflow of new published matter a partial idea can be obtained from such abstracts of selected papers as are published in the *Journal of the Royal Microscopical Society*; while the entire literature of each year is indexed and summarised in the volume of the *Botanischer Jahresbericht*. The most ready and convenient method both of obtaining a general idea of the literature of the subject, and of threading one's way into any of its minor mazes, is by help of Jackson's *Guide to the Literature of Botany* (Index Soc., 1880), and thence by the above named.

3. *Method of Botanical Study.*—While the professed student of botany cannot avoid embarking upon this sea of literature, he can now happily obtain such more or less adequate section charts as are afforded by the manuals of Vegetable Physiology, of the Vegetable Kingdom, or of such special groups as Fungi and Bacteria, which the rising synthetic spirit of recent years has fairly commenced to supply. The beginner, however, demands a single introductory text-book; and simple as his demand may seem, it is generally the most difficult to supply. At best, such manuals can never replace good practical oral teaching, or keep abreast of the most recent developments of knowledge. Many of the existing manuals are even positively mischievous. Survivals of one or other of the earlier phases of the science, they land the student at the very outset at some long-past stage of its progress, where he is only too likely permanently to remain. And when not altogether pre-physiological and pre-evolutionary, they are apt to introduce the student to evolution and physiology at the conclusion of his course of study, instead of training him from the outset to grasp and interpret everything by their aid.

The worst of these many introductory manuals are mere crowded morphological compilations, all more or less antiquated, if not inaccurate. Even when they do not confuse and repel the student from the outset, they are wont to reverse that fundamental principle of progress from the known

towards the unknown which underlies all effective research. To the beginner the cell and protoplasm are not the fundamental units that they are to the teacher; they are precisely the things which lie furthest from his experience, and are only intelligible as the ultimate results of a long process of analysis (cf. BIOLOGY, § 3). Most manuals still retain these grammarian's vices more or less completely; Sachs's long serviceable *Text-book* was no exception. A partial transition is afforded by the mode of teaching, and series of manuals, of which Huxley and Martin's well-known *Elementary Biology* is the type. Here, although the attractive but illusory simplicity of proceeding from the solitary cell towards the cell-complex presented by the higher plants is retained, the steps are worked out concretely in the laboratory by the student for himself. Yet this utter change of the field of experience, or at least its sudden narrowing and deepening to that of the microscope, is not found in practice to be widely satisfactory or attractive to the student; for it is with the changeable carpet of the woods and fields, and its world-summary in the botanic garden, that most of the problems of the science and of its general interest alike for ever lie. With child and herbalist the student must begin in the fields, must learn on the one hand to observe and delight in the varied life of plants, and on the other to collect and name and analyse its forms. His studies begin with the buttercup, not with the amoeba; hence should be mentioned Oliver's small manual of *Elementary Botany* (1st ed. 1863), in which we have some record of the village-school teaching of Henslow, the botanist to whom Darwin was wont gratefully to ascribe the first scientific impulse of his life. Even in the best of such books the morphological bias usually remains; and hence it is that the majority of beginners soon instinctively abandon the whole subject as 'dry,' while the minority tend to become, with too many field naturalists, mere unthinking herborisers, and as Schleiden was wont to bewail, become intellectually lost and smothered amid accumulations of mere unused 'hay.' When this tendency is guarded against, however, a *flora* is invaluable; while even the worst text-book may be helpful as a work of reference. Among relatively good manuals may be mentioned those of Gray, Van Tieghem, Sachs, Strasburger, the last for choice.

Is there then no way of escape from this perpetual tendency to the desiccation alike of the matter and of the spirit of the science? Assuredly; it is simply that while we have indeed to collect, and name, and analyse in death, these are not ends in themselves, but simply means towards widening and deepening the continuance of that observant delight in the sum of living things with which our interest surely began. In a word, the highest modern botany neither harvests plants with the herbalist, nor picks them to pieces with the child, but finds alike its rise and climax in watching the blossoms open and the bees come and go. The pedigree of the science is only on one side from the herbals of Dioscorides and Brunfels to the system of Linnaeus or Jussieu; the other and nobler line rises in Virgil's song of living nature, runs through the keen yet simple records of naturalists like those of Selborne and Walden, and culminates in the monumental volumes of the greater naturalist of Down. It is in the school, or rather garden, of Darwin, viewed both as the last of the old-world naturalists and as the first of evolutionists and physiologists, that our modern 'introduction to botany' must begin; studies in the herbarium of the systematist and the special laboratories of the physiologist, anatomist, and microscopist may follow thereafter as occasion requires. For the age of mere analysis, guided only by the love

of incessant novelty, or even by that of unity amid details, is ending; the student may now approach the science in a new spirit, since he can interpret its literature as but the incipient record of that vast drama of the evolution of life, at which it is his rare good fortune to be an awakening spectator.

Avoiding at the outset all terminology, and even all anatomy as well, the beginner cannot do better than attempt some actual observation of plants in their living relations, as of flowers to insects, and the like, and read some of the abundant and popular literature of such subjects. Or if his curiosity need awakening, it cannot fail to be stimulated by such a tale of living wonders as Darwin's classic *Insectivorous Plants*. His introduction to the subject through such characteristically animal attributes as digestion, movement, and sensitiveness, has the peculiar advantage of soon leading him to see how these are only the more conspicuous developments of functions widely diffused throughout the whole vegetable world, and inherent in all living matter alike. When these apparent anomalies are once understood as illustrations of the thorough unity of organic nature, he may still follow the course of Darwin's own mind and work in his *Climbing Plants and Movement in Plants*, and see how the wonderful sensitive-plant shows only a development of the 'sleep movements' of every cabbage-seedling, or how climbing and twining have been generalised with all other plant-movements as mere developments of the gentle *circumnutation* of every growing point. This is indeed questioned in detail, yet the fundamental lesson will have been learned, and the conventional Linnean and utilitarian conception of the plant, as a mere specimen, useful or otherwise, will have been clearly replaced by the physiological one.

But plants not only move but grow: they have relations to soil and atmosphere; they thirstily absorb and copiously transpire. Here we have to inquire into the chemical composition of plants, to investigate their ash and their organic constituents, and to inquire how these were respectively obtained (see VEGETABLE CHEMISTRY, SOILS, &c.). The germinating plant and the blossom are manifestly breathing, sometimes as warmly as an animal (see ANIMAL HEAT); yet this, again, is no anomaly, for all living matter must oxidise and burn away. The functions of the leaf next engage us. We find that given green colouring matter (see CHLOROPHYLL), it can seize the energy of sunlight, reduce the carbonic anhydride of respiratory waste, and pour back oxygen into the atmosphere. Leaving for the present the problematical details of this process, but noting the perfect 'balance of nature' between vegetable and animal life, which is the general result, we must pass to the structure of leaves, and study this first in the light of these essential functions, thence working back to the structure of stem and root; and next, in so far as modified in relation to special functions and environment—e.g. floating or submerged, storing or protective from climate or enemies, insect-catching or attracting, and so on; while leaf-arrangement and bud-packing may here be appropriately considered.

But leaves are not merely vegetative, nor even confined to the purposes of the individual life; they became modified in relation to that of the species, and so we have ultimately *flowers*. This subordination of vegetative life powerfully affects the mode of branching, and gives us the phenomena of inflorescence, while in the individual flowers we have to note the forms and uses of all the separate parts—(1) accessory (sepals, petals), and (2) essential (stamens, carpels). We study the adaptation of all these (α) to the collective

and general function of (cross) fertilisation, and (b) to their respective special functions—(1) protection from climate and enemies, attractive, mechanical; (2) reproductive. The deep modification of floral types in relation to fertilisation by insects or by the wind, as of the lily type towards orchids on one hand, and grasses on the other, next demands notice; and the corresponding utility of floral details—e.g. position and shape of parts, colours, markings, and perfume—may be exquisitely traced.

In the same way, the mature ovary or *fruit* opens up a new wealth of interest; and its adaptations must be traced for (1) protecting the seed from climate and enemies; (2) dispersion of seed—(a) passive, by aid of wind, water, or animals; (b) active, by scattering or planting the seed. Finally, the mature ovule or *seed* rewards attention: its contained embryo has special protection from climate and enemies, its external 'albumen' or its internal store is an accumulated capital for its start in the struggle for existence; and this process of germination has again countless points of interest.

Having in this way gone through the general physiology of the plant, we must not only sum these up into a complete notion of our plants, which we are no longer in danger of thinking of as mere names or specimens, but as varied life-histories. Then, remembering that these are but the individuals of the larger drama, we learn to read some of the complex relations of living beings; to see their incessant individual and interspecific struggle for existence, yet also their increasingly important relations of interdependence.

But this wealth of interesting and varied knowledge, this complex lore of life, encourages us towards a wider and wider acquaintance with the flora, which now promises not merely new specimens for our collection, but an unknown wealth of new knowledge, we may almost say a multitude of strange individual biographies. Yet our observation, to be profitable, must be orderly and detailed; descriptions must be given; and these accurate and exhaustive, yet of tersest, as it were telegraphic brevity. As specimens and descriptions multiply, indexing and nomenclature become indispensable; and thus, at this point, we need help from, and are therefore ready to appreciate, the labours of Linnaeus and the whole systematic school. The conceptions of species and genus, and the modes of arranging these into larger groups, are thus no longer the arid abstractions they necessarily seemed before the intellectual need had arisen, but are now indispensable aids; while classification is no longer viewed as an arbitrary jargon only to be learned by rote, but as a provisional attempt towards the rational statement of the actual likenesses and differences between kindred forms, and towards the estimation of their relative importance. See BIOLOGY, § 2.

But since our systematic studies have now brought us face to face with the quarter of a million or more species of the modern herbarium, we require a botanic garden to illustrate a selection of these, nay, a smaller 'type botanic garden' as a key to this again. The phanerogamic series, and in some measure also the cryptogamic orders also, thus commence to lie more clearly before us. Finally, some knowledge of the distribution of the vegetable kingdom in space and time is here seen to be reasonable, and therefore interesting.

Our attempts at classification—at discerning the degrees of likeness—compel a detailed comparison of stems and roots, of leaves and flowers, and this often leads to a difficulty which long perplexed the botanist as well as the zoologist. Obvious and superficial resemblances due to

similarity of environment and function are seen to overlie irreconcilable differences of internal structure or principle; while conversely, some given structural principle becomes modified in the most widely different ways for function and environment. This at first led to mere confusion, but the patient and critical researches of the past generation have clearly distinguished between physiological and morphological resemblance (see MORPHOLOGY); while, finally, the study of individual development and racial evolution enable us to interpret these apparently fundamental and often functionless morphological characters as the residual traces of what were once themselves physiological adaptations in their turn; thus finally demonstrating that ultimate subordination of morphology to physiology which has already been so frequently pointed out. Within its minor province, however, which we have now fairly reached, the study of pure morphology must be abstracted from physiological considerations, and thus yields a series of generalisations of an intellectual simplicity and beauty analogous to those of the crystallographer's. The utmost varieties of form in stem and root are generalised into the conceptions of ascending and descending *axes*; similarly, disregarding shapes and uses, we have bulb-scales, bud-scales, foliage-leaves, and bracts all generalised with sepals, petals, stamens and carpels as *appendages*. Conversely, the plant thus reduced to axis and appendages may be gradually modelled back into the essential types of the various natural orders.

Next, tissues and cells need consideration from the same strictly morphological standpoint, apart from use. Axis and appendages are thus reduced to their constituent systems of tissues—epidermic, fundamental, and fibro-vascular—and these may be either modelled in thought into the many varieties of tissue, of which these furnish the common materials, or traced back to the primeval embryonic tissue from which they are themselves differentiated. This, again, is found to have arisen from the multiplication and differentiation of a single embryonic cell, the (fertilised) plant-egg. And in this way the full magnitude and beauty of Schleiden's deep generalisation of ultimate unity of vegetable composition, which we call the cell theory, becomes manifest when we have similarly worked towards it, and, as it were, rediscovered it for ourselves (see CELL). From this to protoplasm, and thence to the attempt to return along that return wave of progress from simple cell to cell-aggregate and cell-complex, with which, as we have seen, so many manuals attempt to start, is an easy step. Such treatises may now profitably be employed; and we may, as it were, proceed to build up the living world afresh. We thus return once more to the actual living plant with which we started, yet rich in the results of our prolonged analysis. We know the process of development, the facts of structure, and their relation to function; hence the plant, as it were, is transparent to the intellectual eye, and our final mental image of it is something wholly different from the shrivelled index-mummy of an earlier but aberrant botanical school; it is a *working thought-model* which not only develops under the mental eye from unicellular simplicity to ultimate individual form and complexity, but in which all that is known of the details of structure and processes of life can be summoned up and watched at will, and of which the very incompleteness furnishes a perpetual suggestion and impulse to new research.

Although the processes of physiology and development have thus been kept in prominence from the outset, the cognate question of the origin of plants still remains for discussion. The history of the

conception of organic evolution, and the evidences of its actual occurrence, have yet to be set forth; while, if evolution has actually taken place, its rationale still demands explanation. The various hypotheses dealing with this, more especially the current one of natural selection, have thus to be considered; but the problem of variation demands a deeper treatment, of which the essential results have been already indicated under BIOLOGY (§ 6). In any case, so much is clear that our studies culminate in the perception of the vegetable kingdom as a genealogical tree. Our ultimate thought-model is thus 'the great tree of life, which fills with its dead and broken branches the crust of the earth, and covers the surface with its ever-branching and beautiful ramifications.' The problem of accounting for this incessant branching, of determining the law of this beautiful ramification, may therefore be postponed to EVOLUTION.

4. *Botany in Education.*—The place of botany in medical education is historically due to its fundamental relation to *materia medica*, and hence, since pharmacy is becoming completely distinguished from medicine, the teaching of botany is being abandoned in some medical schools. Yet its claims reappear in a far stronger way when it is considered as a preparation in elementary biology. For although the student of medicine may not unjustifiably care little for the collection or dissection of plants, viewed as an end in themselves, he can never dispense with that training in reading the processes of organic life which is afforded by these their simplest manifestations.

As a subject of general education, too, the importance of botany has long been recognised, and now that the dryas dust teaching of the subject is being superseded by a more living and interesting method, its re-adoption into the curriculum both of schools and colleges is in progress, and the botanic garden is becoming a familiar adjunct of the school. At anyrate so far as observing goes, the study of botany may more effectively be commenced in childhood than in later life, while initial discipline in drawing, in manipulation, and in the accurate use of language, may all be profitably associated with it. And if it be admitted that for the study of the social sciences preliminary biological studies are requisite, it is in obtaining some concrete acquaintance with the facts of botany that such preparation most conveniently begins.

See, besides BIOLOGY, and the articles on the several plants, groups of plants, and botanical authors, the following:

Algae, Seaweeds.	Evolution.	Mosses.
Aquatic Plants.	Ferns.	Ovule, Seed.
Bacteria.	Flower, Fruit.	Palaeontology.
Bark, Bast.	Function.	Parasitic Plants.
Botanic Garden.	Fungi.	Phanerogamia.
Branch.	Geog. Distrib.	Plants.
Bud, Bulb.	Gymnosperms.	Protoplasm.
Cell.	Heredity.	Reproduction.
Chlorophyll.	Inflorescence.	Sex.
Cryptogamia.	Insectivorous Plants.	Species.
Cycads.	Leaf.	Stamens.
Darwinian Theory.	Lichens.	Stem, Root.
Dicotyledons.	Life.	Variation.
Embryology.	Monocotyledons.	Vegetable Physiology.
Environment.	Morphology.	Wood.

Botany Bay, a shallow inlet in the coast of New South Wales, 5 miles S. of Sydney, discovered by Cook on his first voyage in 1770, and named by him from the great number of new plants in its vicinity. The spot where Cook landed, on the south shore, is now marked by a monument. Though the first settlers refused to land there, preferring the safer anchorage and better water-supply of Sydney Cove in Port Jackson, the name long continued to be the popular designation, not merely of this convict settlement, but of the Australian convict settlements generally.

The north-eastern and southern shores are still remarkable for the variety and beauty of the flowering shrubs and plants with which they are covered. Otherwise the bay is bordered by a ring of Sydney suburbs, mainly residential, though the northern suburb, which still retains the name Botany, includes many factories.

Both, ANDREAS (1609-50) and **JAN** (1610-56), painter brothers, were born at Utrecht. Jan painted landscapes in the style of Claude, while Andreas filled in the figures skilfully.

Botha, LOUIS (1863-1919), born near Vryheid, in the Transvaal, was member for his district in the first Volksraad, became a veld-cornet at the outbreak of the war of 1899-1902, and after the death of Joubert was commander-in-chief of the Boer forces, showing exceptional military capacity. A member of the Privy-council, he became prime-minister of the Transvaal colony in 1907, and of the Union of South Africa in 1910, having won the respect and confidence of the opposing interests by his transparent honesty and zeal for the well-being of all sections of South Africans. While still premier he commanded the Union forces in South-west Africa (1914-15), and received the surrender of the German army.

Bothie, specifically a barely furnished, generally uncomfortable habitation for farm-servants, mainly in the north-eastern counties of Scotland; situated either under the same roof as the stable, or oftener at a short distance from the steading. While the cubic contents are invariably disproportionate to the number of inmates, the furnishings are of an uninviting, sometimes actually repulsive character. One long, roughly manufactured table, a few long stools, a chair or two, a number of victual bunks, a few wooden caps or bowls, and a pot or two, constitute the bulk of the fittings. The inhabitants are generally unmarried men, who frequently have their own food to prepare. Some of the larger farmers provide a woman for cooking and cleaning the bothie. The bothie system can only be defended as under present circumstances a necessary evil. With the increase of farm-cottages, and under the pressure of public opinion and the growing desire for social elevation, the evil is diminishing, and will, there is reason to hope, be entirely abolished.

Bothnia, the name formerly given to a country of Northern Europe, extending along the east and west shores of the Gulf of Bothnia, the eastern portion now being comprised in Finland, and the western forming part of the Swedish province of Norrland.

The GULF OF BOTHNIA is that part of the Baltic Sea (q. v.) which lies to the north of Åland Islands, having on its eastern shore Finland, on the western and northern Sweden, including Lapland. It extends from 60° to 66° N. lat. and 17° to 25° 35' E. long., its greatest length being 415 miles, and its average breadth 100 miles. Its depth varies from 20 to 50 fathoms, but both along its shores and in the middle are many small islands, sand-banks, rocks, and cliffs, called *skaers*, which render the navigation difficult. It has many good harbours, and from Hudiksvall, Sundsvall, and other ports, timber is largely exported. The rivers which fall into this gulf, both from Sweden and Finland, are numerous; in the upper part of the gulf the alluvial deposits from these have caused the land to extend; in the extreme south-west, on the contrary, the land has apparently been sinking. The waters of the gulf are but slightly salt when the river-flow is greatest; but much more so in winter when the streams are frozen. In winter it is usually so hard frozen that it can be crossed by sledges.

Bothriocephalus (Gr. *bothrion*, 'a little pit,' and *cephalē*, 'the head'), a flat parasitic worm allied to the tapeworm (*Tænia*), in the class Cestoda. In its adult stage it is chiefly found in man and dogs,



Bothriocephalus.

and is common in some parts of Europe, such as Western Switzerland, Northern and North-western Russia, Sweden, &c. The adult form consists of a small 'head' without hooks, but with two spindle-shaped lateral suckers, and of a long chain of joints budded off from the attached region. The joints are at first very slender, but gradually increase in length and breadth (the latter always the greater), and become at a certain distance from the head sexually mature 'individuals.' The joints differ conspicuously from those of the common tapeworm in the position of the genital apertures on the flat surface, and also in this, that they are not liberated from the host individually, but in stretches of a few at a time. The total chain may attain the prodigious length of 5 to 10 yards.

The life-history of the common *Bothriocephalus* of man (*B. latus*) cannot yet be said to be fully known with certainty. The embryo which escapes from the eggs of the ripe expelled joints (*proglottides*) differs from that of the *Tænia* in being ciliated and devoid of hooks. It is free-swimming, and passes, according to Braun, into a fresh-water fish—Pike (*Esox*) or Burbot (*Lota vulgaris*). There it becomes the usual asexual bladder-worm, after it has passed from the gut into the muscle of the fish. When the fish is eaten raw or half-cooked by dog or man, the bladder-worm becomes the 'head' of the *Bothriocephalus*, and attaching itself to the intestine, buds off the long chain of sexual individuals or joints. These are liberated as they ripen, and so the vicious circle is complete. *B. cordatus* is another not uncommon species found in fish-eating animals and occasionally in man. There are numerous species, some of which occur, as we would expect, in birds. *Bothriocephalus* is not so firmly attached to its host as the *Tænia* usually is, and thus admits more readily of expulsion by purgatives and similar expedients. An obvious preventive precaution for man is to see that the fish (*Esox* and *Lota*) be well cooked. See CESTODES, PARASITISM, TAPEWORM; and Leuckart's *Parasites of Man*.

Bothwell, a village of Lanarkshire, on the right bank of the Clyde, 8 miles SE. of Glasgow. The parish church includes the choir of the old collegiate church (1398; restored 1898-99). The river is crossed here by Bothwell Brig, the scene of Monmouth's bloody defeat of the Covenanters in 1679. A mile from the village are the stately ruins of Bothwell Castle, at whose base the Clyde washes the fair scenery of 'Bothwell Bank,' famous for centuries in Scottish song. Held before that by Olifards and Murrays, Bothwell Castle was possessed by the Douglasses from 1365 till 1455; and to them it reverted in 1492, being now owned by their representative, the Earl of Home. Thus, contrary to Professor Schiern's statement, the infamous Earl of Bothwell had no personal connection with the castle, as neither had his nephew, Francis

Stewart (circa 1563-1624), who in 1576 was created Earl of Bothwell, and who figures in history through his daring attempts to obtain possession of the person of James VI. Bothwellhaugh, about 2 miles ESE., gave designation to James Hamilton, assassin of the Regent Moray. Joanna Baillie was a native of Bothwell. Population, 4000. See Sir W. Fraser's *Douglas Book* (4 vols. 1885).

Bothwell, JAMES HEPBURN, EARL OF, born in 1536 or 1537, received an ill training at Spynie Castle under his grand-uncle, Bishop Patrick Hepburn of Moray, and in 1556 succeeded his father as fourth earl and as hereditary Lord High Admiral. One of the greatest nobles in Scotland, he professed adherence to the Reformation, but stood staunchly by Mary of Guise, the Queen-regent, who in 1558 made him Warden of the Border Marches, and in 1560 sent him on a mission to France. Then it was that he first saw Queen Mary, and then that Throckmorton described him to Elizabeth as 'a glorious, rash, and hazardous young man, one whom his adversaries should have an eye to.' In 1561, shortly after her landing at Leith, Mary made him a privy-councillor; but his own turbulence and Murray's jealousy made the next three years of his life a period of captivity or exile—captivity first at Edinburgh Castle, and then for more than a twelvemonth in England. Not till her marriage with Darnley did Mary recall him from France; but, on 20th September 1565, she restored him to all his dignities; and five months later he married at Holyrood, with Protestant rites, the Catholic sister of the Earl of Huntly. By hostile accounts, he had ere this had many mistresses, and was addicted to far fouler vices. The hurried events of the next sixteen months must be told in full in our life of Queen Mary—the murder of Rizzio by Darnley (9th March 1566), the birth of James VI. (19th June), Bothwell's appointment as keeper of Dunbar, Mary's visit to him at Hermitage Castle, where he was lying sore wounded by the outlaw Jock Elliot (16th October), Darnley's murder by Bothwell (9th February 1567), the mock trial and acquittal (12th April), Mary's abduction to Dunbar (23d April), Bothwell's divorce (3d and 7th May), his elevation to the dukedom of Orkney (12th May), his marriage to Mary (15th May), and the last parting at Carberry Hill (15th June). On the 27th he sailed from Dunbar, and after brief visits to the Earl of Huntly and to Spynie Castle, passed on to Orkney and Shetland. Narrowly escaping a squadron sent in pursuit, and driven by a storm over to Norway, on 2d September he was brought by a Danish warship into Bergen, and detained as having no passport. He never regained his freedom, but from January 1568 was imprisoned at Malmö, and from June 1573, more rigorously, at Dragsholm in Zealand, where he seems to have gone mad before his death, on 14th April 1578. His Declaration, or so-called 'Testament,' acquitting Mary of all share in Darnley's murder, must, if genuine, have been made before October 1569, but is probably a forgery. See his *Life* by Professor Schiern (Danish, 1863; 2d ed. 1875; Eng. trans. by the Rev. D. Berry, 1880).

Botocudos, the most barbarous of the Indian tribes of Brazil, inhabiting the East Coast range, between the Rio Pardo and the Rio Doce. They are of middle height, sturdily built, and have small hands and feet; their features are strongly marked, with broad cheek-bones, and repulsively thick lips and nose, redeemed by white, regular teeth, and sparkling black eyes. They are rather yellow than copper-coloured, and their hair, of which only a tuft is worn on the smooth-shaven head, is not quite black. Their name is derived from the

Portuguese *botoque*, 'bung-hole,' with reference to their under-lip pierced to hold a disc of wood, sometimes $3\frac{1}{2}$ inches in diameter. They generally go quite naked, and have no fixed settlements, but in their wanderings through the country keep the routes open by means of bridges of creepers woven into ropes. Their food includes anything not absolutely poisonous that will stay their hunger; even soft earth is eaten. Their speech is entirely distinct from that of the other Indian nations; they have no religion, properly speaking, but are abjectly afraid of spirits. As intractable cannibals they were cruelly dealt with, their numbers being reduced from 60,000 to some 12,000.

Botolph, the patron saint of Boston (q.v.), died in 680.

Botosani, or BOTOSHANI, a town of Moldavia, on the Shiska, 62 miles NW. of Jassy, at the terminus of a branch railway, has an active trade in country produce, cattle, grain, and timber; pop. 33,000, about half of whom are Jews.

Bo-tree, the name given in Ceylon to the PIPAL or PEEL (q.v.) of India (*Ficus religiosa*). It is held sacred by the Buddhists, and planted close by every temple. The Bo-tree of the sacred but ruined city Anuradhapura, 80 miles N. of Kandy, is in all probability the oldest tree in the world. It is said to have been planted in 288 B.C., as a branch of the tree under which Gautama sat when he became Buddha. Sir James Emerson Tennent believed that the tree was in 1859 really of the wonderful age of 2147 years. Its leaves are carried away as treasures by pilgrims. The main stem was broken off by a storm in October 1887, and the severed portion solemnly cremated with religious rites. See Ferguson, *Ceylon in 1884*.

Botrychium. See MOONWORT.

Botrytis, a genus of Hyphomycete Fungi (see FUNGI), containing many of the plants commonly called Mould and Mildew (q.v.). The silkworm disease known as Muscardine (q.v.) is caused by *B. Bassiana*. Some species have been identified as simply conidium-bearing forms of Ascomycetes, like *Peziza* and *Sclerotinia*.

Botta, CARLO GIUSEPPE GUGLIELMO, an Italian poet and historian, born in Piedmont in 1766, studied medicine in Turin, and in 1794 became a physician to the French army. In 1799 he was appointed a member of the provisional government of Piedmont. After the incorporation of Piedmont with France, he repaired to Paris, where, as a member of the *Corps Législatif*, he gave offence to Napoleon. After the Restoration he became rector of academies at Nancy and Rouen; and in 1830 he was allowed to return to his native town, and received a pension. He died in Paris, August 10, 1837. Early works are those on Corfu (1799), Dalmatia (1802), and the American Revolution (1809); and his epic poem, *Il Camillo* (1806). His most important works are the *Histoire des Peuples d'Italie* (1825); and *Storia d'Italia dal 1490 al 1814* (20 vols. 1832), which consists of Guicciardini's work (1490-1534), and his own continuation of it. See the Life of him by Pavesio (1874).

Botta, PAUL ÉMILE, a distinguished archaeologist and traveller, the son of the preceding, was born at Turin in 1802. After extensive travels in the New World and in Egypt, he became in 1833 French consul in Alexandria, and thence undertaking a journey to Arabia, published the results in his *Relation d'un Voyage dans l'Yémen* (1841). He was soon after appointed consular agent at Mosul, and commenced a series of discoveries which form an epoch in archaeological science. Early in the spring of 1843 Botta began his diggings in the heaps of ruins near the Tigris

for monuments of Assyrian antiquity; and the *Journal Asiatique* soon contained accounts of his enterprise, and disquisitions on the cuneiform writing, which afterwards appeared as a separate publication under the title, *Mémoires de l'Écriture Cuneiforme Assyrienne* (1848). The French government took up the matter warmly, and a commission of learned men was appointed to conduct the publication of the magnificent archaeological work, *Monuments de Ninive* (1847-50). In 1848 he published *Inscriptions découvertes à Khorsabad*. In 1846 Botta was appointed consular general at Jerusalem, and in 1857 at Tripoli. He returned to France in 1868, and died at Achères, near Poissy, 18th April 1870. See ASSYRIA, BABYLONIA.

Bottesini, GIOVANNI, contrabassist, born at Crema, in Lombardy, 24th December 1823. A concert tour, begun in 1840, and extending to America, established his fame as the greatest master of the double-bass fiddle. From 1846 he was director of Italian opera in Havana, Paris, Palermo, and Barcelona, and died 7th July 1889, director of the conservatory at Parma. His compositions include four operas and an oratorio; but his best work is his *Méthode Complète de Contre-basse*.

Böttger, JOHANN FRIEDRICH, improver of the porcelain manufacture, was born 4th February 1682 in Reuss-Schleiz. He became an enthusiast in the search for the philosopher's stone, and found patrons at the court of Saxony. The king, dissatisfied with his gold-making, sought to avail himself of the skill which Böttger really possessed, and the latter was compelled to enter upon those experiments, of which the celebrated Meissen Porcelain was the result (see POTTERY). He died March 13, 1719.

Botticelli, SANDRO, originally Alessandro di Mariano dei Filipepi, a great painter of the Tuscan school, was born at Florence in 1444, the son of a tanner, Mariano di Vanni dei Filipepi. He derived his name from his elder brother Giovanni, a thriving broker, nicknamed Il Botticello. Possibly apprenticed to another brother, Antonio, a gold-beater, he was soon sent to study painting with Fra Lippo Lippi, and was with him during the period of the Pieve frescoes at Prato. The influence of these is very strong in an early 'Adoration of the Magi' in the National Gallery, London. To Lippo's delicacy Botticelli added Antonio Pollaiuolo's relief and movement in the Uffizi 'Fortitude,' a picture which shows also a fleeting influence of Verrocchio. In 1470-73 his old master's son Filippino was his pupil in Florence. Another 'Adoration,' a subject he repeatedly painted, was executed as an altarpiece for Sta Maria Novella, and established his reputation. Literary influences of the Renaissance inspired 'Primavera' (c. 1478) and the much later 'Birth of Venus,' two of his most imaginative works, both painted for Lorenzo di Pierfrancesco de' Medici. The 'Assumption of the Virgin' in the National Gallery is not by Botticelli, but by Francesco Botticini. Botticelli's colouring, often enriched by gold, is brilliant and fanciful, and the minutest care is shown in all the details of his compositions. His flowers, especially his roses, are painted with marvellous delicacy. In the countenances, whether of Madonnas and angels, or of Venuses and Graces, there is a fascinating expression of wistful melancholy. Among Botticelli's greatest works are his three frescoes, representing the 'Life of Moses,' the 'Destruction of Korah,' Dathan, and Abiram, and the 'Temptation of Christ,' executed in 1481-82, in the Sistine Chapel at the Vatican. For the next twenty years he was the most popular painter in Florence. His style in 1482-92 becomes more severe. To this period belong 'The Birth of Venus,' 'Mars and Venus,' 'The Coronation of the Virgin' (Florence

Academy), the circular Madonnas in the Uffizi, and the 'Annunciation,' also there. Botticelli's brother Simone was a follower of Savonarola, and the painter seems to have come under the same influence, but only about the time of Savonarola's execution. Evidence of his conversion, which seems to have cost him the patronage of Lorenzo di Pierfrancesco, has been traced in the 'Nativity' in the National Gallery, the mystical inscription on which appears to give its date as 1500. His great series of pen and silver-point drawings (c. 1492-97), illustrating the *Divina Commedia*, was acquired by the Berlin Museum at the Hamilton Palace sale. It has been admirably reproduced in phototype, with the addition of eight other drawings of the set which were discovered in the Vatican, and facsimiles of the engravings to the Dante of 1481, on which he was probably engaged when interrupted by the summons to Rome. Botticelli died in 1510.

Botticelli was ignored by early 19th-century art critics, and was not even named by Roscoe. See, besides the histories of Italian painting, books on him by Ullmann (1894), Phillimore (New York, 1894), Plunkett (1900), Julia Cartwright (Mrs Ady, 1904), Diehl (Paris, 1906), Binns (1907), Binyon (1913), and especially Horne (1908).

Böttiger, KARL AUGUST, a German archaeologist, born in 1760 at Reichenbach, in Saxony, was successively rector at Guben (1784) and Bautzen (1790), and director of the Gymnasium at Weimar (1791). His literary activity was prodigious, but his works, once held in high estimation, are now only valued for the mass of materials they contain. From 1804 he delivered lectures on special branches of classical antiquities and art at Dresden, where he died in 1835. Among his writings may be mentioned *Sabina* (1803), *Amalthea* (1820-25), and *Ideen zur Kunst-mythologie* (1826-36). His smaller works were collected and edited by Sillig (1837).

Bottle (Fr. *bouteille*, from late Latin *buticula*, diminutive of *butis*, 'a butt'), a vessel, generally of a round shape, with a narrow neck, for holding liquids. The first bottles were probably made of the skins of animals, mostly goats. Skin bottles are still used in southern Europe for the transport of wine, and by tribes of Africa and Asia for carrying water. The ancient Egyptians had bottles of alabaster, stone, gold, ivory, and other substances. Glass bottles, often of great beauty, were made by the Phœnicians and Romans, and in the middle ages at Venice. Porous earthenware bottles have been long in use in the East to keep water cool in. The Chinese have beautiful small bottles of jade, rock-crystal, agate, and a peculiar glass of two coloured layers. Modern bottles are chiefly made of glass (q.v.), and of stoneware (see POTTERY). See BOTTLING.

From old French *botel* comes *bottle* in the sense of bundle, as in the phrase 'a bottle of hay.'

Bottle-brush Plants, a name applied to species of *Metrosideros*, *Callistemon*, and other genera of Myrtaceæ (q.v.), which agree in having sessile crowded flowers with reduced floral envelopes, but large conspicuous compound stamens; the whole inflorescence thus suggesting a red bottle-brush.

Bottle Chart is one which purports to show the track of sealed bottles thrown from ships into the sea. Lieutenant Becher, an English naval officer, constructed in 1843 a chart of bottle-voyages in the Atlantic, so as to illustrate the currents. The time which elapses between the launching of the bottle from the ship and the finding it on shore, or picking up by some other ship, has varied from a few days to sixteen years; while the straight-line distance between the two points has varied from a few miles to 5000 miles. The

Bottle Chart has been re-edited from time to time, and republished.

Bottle-glass. See GLASS.

Bottle-gourd (*Lagenaria*, from Lat. *lagena*, 'a bottle'), a sub-genus of *Cucurbita* (natural order Cucurbitaceæ, q.v.). The Common Bottle-gourd, or False Calabash (*C. lagenaria* or *L. vulgaris*), is a native of India, but is now common almost everywhere in warm climates. It is a climbing musky-scented annual, clothed with soft down, having its flowers in clusters, and a large fruit, from 1 to sometimes even 6 feet in length, which is usually shaped like a bottle, an urn, or a club. The fruit has a hard rind, and when the pulp is removed and the rind dried, it is used in many countries for holding water, and is generally called a *Calabash* (q.v.). In its wild state it is very bitter and poisonous, and even in cultivation some of its varieties exhibit not a little of the bitterness and purgative properties of *Colocynth* (q.v.). Other varieties, particularly the more luxuriant, however, have a cooling edible pulp. The bottle-gourd appears to have been introduced into Europe about the close of the 16th century, but it requires for its advantageous cultivation a warmer climate than that of Britain. It is, however, much cultivated in warmer countries as an esculent, and its rind lends itself to many domestic uses, often furnishing, for instance, not only bottles and dishes, but spoons and hats. It is grown in some parts of the United States. Another species, *L. idololatrica*, is a sacred plant of the Hindus, much employed in their religious ceremonies.

Bottlehead, or BOTTLENOSE (*Hyperoodon*), one of the toothed whales in the same family as the Sperm (*Physeteridae*). The most striking feature is the abrupt rise of the head from the small snout. The bones forming the front of the upper jaw rise suddenly behind the nostrils, expanding in crests as they ascend. The result is a rounded and prominent upper head. There is a small conical tooth hidden in the gum at the end of each lower jaw, and sometimes another behind this again. The blow-hole



Bottlehead.

is crescent-shaped. The colour is blackish, verging to white below. Two species are certainly known, both from the North Atlantic, and sometimes found in the North Sea. *H. rostratus* (or *bidens*, or *butzkopf*), the common *Bottlenose*, measures about 24 feet in length, and is sometimes stranded on European shores. One described by Hunter in 1787 was caught above London Bridge. *H. latifrons* is somewhat larger, has a flatter forehead, and attains a length of 30 feet. The genus *Xiphius* is closely allied. The *Hyperoodon* must be distinguished from the Bottle-nosed Dolphin (*Delphinus tursio*) occasionally found on British coasts. See CETACEA, WHALE.

Bottling must be done with every possible precaution to exclude the many organisms always floating about in the atmosphere. The bottles and their corks or stoppers must be scrupulously clean, and so must the liquids or other substances put into them. See GERM. With spirituous liquors, antiseptics, and other non-putrescible things there is no trouble, but with beer, aerated beverages containing syrup, some low-class wines, bottled fruit, very dilute aqueous solutions, &c., there is great fear of the growth of various moulds

and the putrefying influence of bacteria, which can easily grow in these media if their germs happen to get into the bottles. Therefore great care is taken by all the best manufacturers and bottlers of these goods thoroughly to clean or sterilise the bottle and its cork or stopper, as well as the contents, before bottling. If this is carefully done there is no need to use any of the preservatives or antiseptics which are well known, but should be kept out of food on account of their more or less deleterious physiological actions. When corks are used it is advisable to pour boiling water over them just before putting them into the bottles, to sterilise, clean, and soften them. They are then easily driven into the bottle-neck, and as soon as this is done the liquid inside the bottle should be made to touch the cork to ensure that it shall be in the same condition as the rest of the inside of the bottle. Many things may be sterilised by heating them to 180° F. for a little while in the bottle before corking, but in this case care must be taken that no unfiltered air enters the bottle afterwards, lest it should introduce bacteria. In other cases the liquid is carefully filtered just before it is put into the bottle. The so-called aerated beverages are impregnated with carbonic acid gas at the time of bottling, and are thus forced into the bottle under a pressure varying from a few pounds per square inch to 100 lb. or more. At first we might perhaps suppose that this gas would prevent the growth of bacteria, but experience teaches us that some forms grow very rapidly under these conditions.

There are many ingenious machines in daily use for bottling all kinds of beverages, and for putting in the corks, screw stoppers, and various other devices with considerable rapidity, 50 dozen bottles an hour being easily filled and finished. Perhaps the most rapid bottle to fill is that with a glass ball inside it for a stopper. This bottle is put into a machine, which clamps it top and bottom, and holds its mouth against an india-rubber washer, through which the liquid is forced into the bottle. As the bottle fills it is inverted, and the glass ball drops on to another india-rubber ring fitted inside the neck, where it is held by the pressure inside the bottle when it is removed from the machine. These bottles are opened by simply pushing down the glass ball, when the contents may be easily poured out. The usual speed for filling these bottles is about 120 dozen an hour. See AERATED WATERS.

Bottomley, GORDON, poet and dramatist, was born 20th February 1874, at Keighley, and educated at Keighley Grammar School. He published several volumes of verse, including *The Fate of Smaragdus* (1904), *Chambers of Imagery* (1907-12); but it is by his poetical plays that he has most impressed his critical readers. Of these, *King Lear's Wife* (1915) gave its title to a collection which appeared in 1920. *Gruach*; and *Britain's Daughter* (two plays) followed in 1921.

Bottomry, BOND OR CONTRACT OF, is a security by which a ship and tackle is expressly mortgaged or *hypothecated* by the owner or master for repairs to the ship, or for money advanced for its outfit or some other necessary purpose abroad. It is called a security by *bottomry*, because the bottom or keel of the ship is figuratively used to express the whole of it. The loan or debt is repayable only in the event of the ship's safe arrival at the port of destination; and in consideration of this risk the lender or creditor exacts a premium, the amount of which depends on the nature of the adventure. If the ship be totally lost, the lender loses his money; but if she returns safely, he recovers his principal, together with interest at the rate agreed upon.

These contracts are not treated as ordinary mortgages, and preferred according to the order of date; but inversely, the latest is preferred to the preceding, because it is presumed that the last loan saved the ship. Bottomry is sometimes granted in the form of a bill, sometimes as a bond, but it must always be in writing, and must state the sum advanced, with the marine interest agreed on (which often amounts to 25 per cent.), the voyage proposed, with the duration of the risk, and whether the security includes cargo as well as ship. The master's authority to grant such a bond arises only in foreign ports, and depends on the question whether the money is necessary to complete the enterprise. The owners of the ship are not personally liable for the advance, as the marine interest generally swallows up their profit, but the master is liable on his own obligation. Where the personal credit of the owner might be obtained by telegraph, the bottomry bond, granted without his authority, is void. The bottomry creditor is not subject to general or particular average. Bottomry was not known to the civil law; the law of the United States is based on that of England. Bottomry contracts, which are subjected to rigid scrutiny, are assignable and negotiable. See INSURANCE, RESPONDENTIA.

Botulism, or SAUSAGE-POISONING. Sausages of pork which have been undercooked or eaten raw are occasionally highly poisonous; and in Germany, where sausages form a staple article of diet, fatal cases of sausage-poisoning are by no means rare. The symptoms are slow in appearing, three or four days sometimes elapsing before they manifest themselves. They resemble those of poisoning by Belladonna (q.v.), and are believed to be due to the presence of animal alkaloids or Ptomaines (q.v.) developed by a special bacillus (*Bacillus botulinus*). Cases observed in Britain differ from those commonly occurring in Germany in this respect, that in England the sausages are usually comparatively fresh, while the sausages which have proved poisonous in Germany had always been made a long time.

Botzen, or BOZEN (Ital. *Bolzano*), an important trading town of German-speaking Tyrol, ceded to Italy in 1919, charmingly situated on the Eisach, 35 miles NNE. of Trent by the Brenner Railway. An Italian-looking place, it has several churches and monasteries—one of the former dating from the 13th century—a castle, and a gymnasium. It is protected from the inundations of a mountain-torrent in the vicinity by a strong wall about 2 miles in length. It has manufactures of silk, cotton, linen, hosiery, leather, flour, and vinegar. Wine and fruits in abundance are produced in the fertile valley of the Adige, protected by lofty mountains. Its earth-pillars are famous. Pop. 25,000.

Boucher, FRANÇOIS, a French painter, was born at Paris in 1703, studied at Rome, and became a member of the Academy (1734), and painter to Louis XV. (1765). He was an artist of much ability, and equally facile in the production of figure and landscape pictures. The number of his pictures and drawings is said to have exceeded 10,000; he also executed engravings. At his death, on 30th May 1770, he was director of the French Academy. See books on him by Gustave Kahn (1905) and Mrs Bearn (1913).

Boucher de Crèvecœur de Perthes, JACQUES (1788-1868), anthropologist and writer, born at Reims. Through his father, an active botanist, he came under the notice of Napoleon, and was employed in numerous missions to Italy, Germany, Austria, and Hungary. He wrote travels, poems, and an early apology for free-trade; but only his works on early man are of consequence

now. His most renowned discovery was that of the much disputed human jawbone in the quarries of Moulin-Quignon, near Abbeville, in 1863.

Bouches-du-Rhône ('mouths of the Rhone'), a department in the south-east of France, formerly a part of Provence, with an area of 1971 sq. m. It is divided into the three arrondissements of Marseilles, Aix, and Arles. Through the northern and eastern districts the Maritime Alps slope gently down to the basin of the Rhone. Towards the seashore there are several plains of considerable extent; the western portion called the Camargue is very unhealthy. The amount of arable land is small; heaths, woods, wastes, and water occupy the rest. The Rhone—which between Arles and the sea separates into several branches, forming a delta, called *Île de la Camargue*—and its affluent, the Durance, are the principal rivers. The department is intersected by several canals of importance, and by a great aqueduct conveying water from the Durance to Marseilles. The soil in some parts is strongly impregnated with salt. The great plain of Crau, to the east, is stony and arid. Besides the Étang de Berre, there are numerous salt-lakes communicating with the sea by natural or artificial channels. Coal, marble, limestone, and gypsum are found. Hats, perfumes, soap, olive-oil, vinegar, and chemical products are manufactured; there are extensive brandy-distilleries and sugar-refineries; the produce of the salt-works is larger than that of any other part of France, and that of wine is large. Pop. (1872) 554,911; (1921) 841,996.

Boucicault, DION, dramatist and actor, was born at Dublin, 26th December 1822, was educated at University College, London, and died in New York, 18th September 1890. Among his 140 and more original pieces and adaptations, produced from 1841, were *The Colleen Bawn* (1860), *The Octoroon* (1861), *Arrah-na-Pogue* (1864), *Flying Scud* (1866), *Formosa* (1869), *The Shaughraun* (1875), and *The Tilt* (1886).

Boudin, LOUIS EUGÈNE, French painter, a forerunner of the impressionists, was born at Honfleur, 12th July 1824, son of a pilot and a stewardess. Till his fourteenth year a cabin-boy, then shop-boy to his father, who had turned stationer at Havre, he was self-taught. With a small allowance from Havre town council, he went to Paris; and for a time he taught painting in an old inn near Havre. At intervals he worked as a labourer, and lived at Trouville, Havre, Deauville, and Brussels. Successful in later life, he died at Deauville in 1898. See Gustave Cahen, *Eugène Boudin: sa Vie et ses Œuvres* (Paris, 1900).

Boué, AMI, geologist, was born at Hamburg, 16th March 1794; studied at Geneva, Paris, Edinburgh, and Berlin; lived at Paris, and then at Vienna, where he died, 22d November 1881. He travelled extensively, and wrote many geological works, one on the geology of Scotland (1820), and three on the geology of Turkey in Europe.

Boufarik, a town of Algeria, 23 miles S. of Algiers by rail; pop. 6000.

Boufflers, LOUIS FRANÇOIS, DUC DE, peer and marshal of France, one of the most distinguished generals of his time, was born in 1644, of an ancient family of Picardy. He began his military career early, and served under the great Condé, Turenne, and Catinat in the wars of Louis XIV., with such distinction that he received the marshal's baton in 1693. His famous defence of Namur against William III. in 1695, and of Lille against Prince Eugene in 1708, made him a duke and peer of France. After the defeat of Malplaquet in 1709,

he conducted the French retreat with admirable skill and success. He died at Fontainebleau, 20th August 1711.—His son, JOSEPH MARIE, Duc de Boufflers (1706–47), was likewise a marshal of France.

Boufflers, STANISLAS, MARQUIS DE, commonly styled the Chevalier de Boufflers, was born at Lunéville in 1737. He was the son of the witty Marquise de Boufflers, who played a brilliant part at the court of Stanislaus, the exiled king of Poland. He became *maréchal de camp*, negrophil governor of Senegal, was a poet and literary man of some note, and much admired in the French *salons* of his time. He died in 1815.

Bougainville, the largest of the Solomon Islands (3500 sq. m.; pop. 15,000), at the NW. end of the group, is very mountainous, reaching 10,000 feet in the mountain of Balbi. Bagama is an active volcano. Bougainville was taken from the Germans by Australians in 1914.

Bougainville, LOUIS ANTOINE DE, navigator, was born at Paris, 11th November 1729, studied there, and attained great proficiency both in languages and science. In 1755 he went as secretary of the French embassy to London. In 1756 he acted as Montcalm's aide-de-camp in Canada, where he served with distinction, as also in the campaign of 1761 in Germany. After the peace he entered the naval service, in which he soon signalised himself. He undertook a voyage round the world (1766–69) with a frigate and a St Malo transport, the first voyage round the world which the French ever accomplished. He gave an account of it in his *Description d'un Voyage autour du Monde* (1771–72). Geography and other branches of science were enriched by it with many discoveries. In the North American war Bougainville commanded several ships of the line, and in 1779 was made *chef d'escadre*; in the following year he was made a field-marshal in the army. After the outbreak of the Revolution he retired from public service, and devoted himself entirely to scientific pursuits. By Napoleon I. he was made a senator, count of the empire, and member of the Legion of Honour. After him are named one of the Solomon Islands, a strait in the New Hebrides, and a bay on the north side of the Strait of Magellan. He died 31st August 1811.

Bougainvillea, a neotropical genus of Nycta-



Bougainvillea, foliage and flowering branches:
a, two sets each of three flower-buds, with coloured bracts.

ginaceæ, frequently trained over trellises or under

the roofs of greenhouses, on account of the beauty of its peculiar inflorescence, the small flowers, which grow in threes, being almost concealed by as many membranous bracts of splendid rosy or purple colour.—The same name is given to a genus of hydroid zoophytes.

Bough, SAMUEL, R.S.A., landscape-painter, was born 8th January 1822, at Carlisle, where for two years he was employed in the office of the town-clerk. He received hints from various painters, but never obtained any systematic art instruction. In 1845 he was a scene-painter in Manchester, and later in Glasgow, where Daniel Macnee, afterwards P.R.S.A., encouraged him to become a landscape-painter; and he shortly produced several sketches in Cadzow Forest, and 'Shipbuilding on the Clyde.' Among the more important of his oil-pictures are 'Edinburgh from the Canal' (1862); 'Holy Island' (1863); 'In the Trossachs' (1865); 'The Vale of Leith' (1866); 'Kirkwall Harbour' (1867); 'Borrowdale,' 'St Monance,' 'London from Shooter's Hill' (1872). His 'Royal Volunteer Review' (1860) is in the National Gallery of Scotland. His best oil-pictures are spirited and expressive in touch, and possess a fine sense of atmosphere; but he frequently painted carelessly and hurriedly. His numerous water-colours are of more uniform excellence; they are strongly influenced by the example of David Cox. He settled in Edinburgh in 1855, became R.S.A. in 1875, and died 19th November 1878. See Life by Sidney Gilpin (1905).

Boughton, GEORGE HENRY, R.A. (1833-1905), was born near Norwich, was taken as an infant to America, and learnt and practised painting at Albany, N.Y.; but afterwards studied in Paris, and in 1862 settled in London. He was said to have 'made a corner in pretty Puritans,' and relied largely on anecdotic interest.

Bougie, a port of Algeria, on the Bay of Bougie, 120 miles E. of Algiers. Bougie was the *Salde* of the Romans, and in the 5th century was a chief seat of the Vandals; under the Arabs it was raised to such importance that it was called Little Mecca, and was the entrepôt of the trade between Christendom and North Africa; but after various vicissitudes, it had sunk to a small village in 1833, when the French captured the place. Their extensive works have since rendered it a strong fortress, and a commercial centre of some value. Pop. 10,500.

Bougies are rods of metal or other substances, used for distending contracted mucous canals, as the gullet, bowels, or urethra (see STRICTURE). For the urethra, they are frequently of German silver or pewter, and vary from $\frac{1}{16}$ th to $\frac{1}{4}$ th of an inch in diameter. Still larger sizes are used by many surgeons. For the other canals, they are usually made of plaited thread, like an ordinary riding-whip, impregnated with a substance called *gum-elastic*, of which the chief constituent is india-rubber. This combination of materials possesses a degree of firmness united with flexibility, and a smoothness of surface very suitable for the end to be attained. In form they are cylindrical, with either a slightly tapered round extremity, or a somewhat acorn-shaped dilatation at or near the point. The name is also applied to rods of similar shape made of gelatin, cacao-butter, or some such substance, which melts at the temperature of the body, and charged with medicaments, which it is desired to apply to the mucous membrane of the urethra or the nasal cavities.

Bouguer, PIERRE, a great French physicist, born at Croisic, in Brittany, 16th February 1698. In 1735 he was sent with Godin, La Condamine, and

Jussieu to South America to measure a degree of the meridian at the equator. During their seven years' absence Bouguer and his companions made valuable observations on the length of the seconds pendulum at great elevations, the deviation of the plumb-line from a vertical position through the attraction of a neighbouring mountain, the limit of perpetual snow, the obliquity of the ecliptic, &c. He published an account of his labours in the *Théorie de la Figure de la Terre* (1749). His investigations concerning the intensity of light laid the foundation of photometry; their results were fully embodied in his *Traité d'Optique* (1760). In 1748 Bouguer invented the heliometer, afterwards brought to greater perfection by Fraunhofer. He died at Paris, August 15, 1758.

Bouguereau, WILLIAM ADOLPHE (1825-1905), was born at La Rochelle. While engaged in business at Bordeaux he was instructed in art; and proceeding to Paris, he worked under Picot, and in the Ecole des Beaux Arts, where in 1850 he gained the *Grand Prix de Rome*, which entitled him to study in Italy, whence he returned in 1855. In 1849 he produced his dignified and austere 'Angel of Death,' but he first made a distinct mark in 1854 by 'The Body of St Cecilia borne to the Catacombs,' which, along with his 'Philomela and Procne' (1861), is now in the Luxembourg. His productions are distinguished by a kind of cultured academic grace, finished and balanced design, and careful execution with a smooth surface. He is seen at his best in classical subjects, and in idealised scenes from rural life.

Bouhours, DOMINIQUE (1628-1702), regarded by Addison as the greatest French critic, was born at Paris, bred a Jesuit, and became professor of grammar and rhetoric at Paris and Rouen. He wrote several works on criticism, a life of Xavier (translated by Dryden), and the epitaph on Molière.

Bouilhet, LOUIS HYACINTHE, French poet and dramatist, was born at Cany (Seine-Inférieure), 27th May 1822. He studied surgery for a time under Flaubert's father, then taught Greek and Latin. Some of his plays in verse—*Mme. de Montarcy*, *Helène Peyron*, *La Conjuración d'Amboise*—were acted with success. He also wrote several volumes of undramatic poems, *Melanis*, *Fossiles*, *Festons et Astragales*, *Dernières Chansons*. He died at Rouen, 18th July 1869.

Bouillé, FRANÇOIS CLAUDE AMOUR, MARQUIS DE, was born in 1739 at the castle of Cluzel, in Auvergne. He served in the Seven Years' War, and became commander-in-chief of the French forces in the West Indies; and from the British he took Dominica, Tobago, St Eustache, Saba, St Martin, St Christopher's, and Nevis. Louis XVI. nominated him a member of the Assembly of Notables in 1787-88; in 1790 he was made commander-in-chief of the army of the Meuse, the Saar, and the Moselle. His decision of character prevented the dissolution of the army and the outbreak of civil war. For his share in the attempted escape of Louis XVI. he had to flee from France. In 1791 he entered into the service of Gustavus III. of Sweden, and afterwards served in the corps of the Prince of Condé. He rejected a proposal made in 1793 that he should take the chief command in La Vendée, and went to England, where his advice in West Indian affairs was useful to the government, and where he wrote his *Mémoires sur la Révolution Française*. He died in London, 14th November 1800. See Gabriel's *Louis XVI., Bouillé, et Varennes* (1874).

Bouillon, a duchy, originally German, in the Belgian part of the grand-duchy of Luxemburg, consisting of a woody and hilly district in the Ardennes, about 145 sq. m. in extent. This duchy

was the possession of the famous crusader, Godfrey (q.v.) of Bouillon, who, in order to raise money for his crusade, pledged it in 1095 to the Bishop of Liège. It was conquered by France in the war of 1672. By the peace of 1814 the greater part of it was included in the grand-duchy of Luxembourg, and the sovereignty of it passed to the king of the Netherlands. By the revolution of 1830 Bouillon, along with Luxembourg, was separated from the Netherlands, and in 1837 united to Belgium.—The principal town is Bouillon, situated among steep hills on the Semois, 9 miles NNE. of Sedan, and near the French frontier. The town lies in the bottom of a deep wooded valley, where the Semois bends sharply round a precipitous rock, on which stands Godfrey's castle. The rock is pierced by a tramway tunnel, connecting the two ends of the town. The romantic scenery of the district has made Bouillon a tourist-resort. Pop. 3000.

Bouilly, JEAN NICOLAS, a prolific French dramatist, born at La Coudraye, near Tours, 24th January 1763. During the fever of the Revolution he filled with rare prudence several important public offices. He died at Paris, 14th April 1842. In his writings Bouilly reveals a character of great elevation and sincerity, but the effect is somewhat marred by his prolixity and by an over-sentimentality that earned him the name of the 'poète lacrymal.' Of his plays the following deserve mention: the comic opera *Pierre le Grand* (1790), *L'Abbé de l'Épée* (1795), *Les deux Sournées* (1800) for Cherubini's music, *Fanchon* (1803), *Une Folie* (1803), *Madame de Sévigné* (1805). He wrote many popular books for the young, including *Contes à ma Fille* (1809).

Boulainvilliers, HENRI, COMTE DE (1658–1722), descended from an ancient family in Picardy, was born at St Cère, in Normandy, served in the army, and wrote largely, from the aristocratic point of view, on the ancient government of France, the French peerage, and the parliament of Paris. Some of his historical works are yet unpublished. He also dabbled in astrology, but is remembered chiefly for his pretended *Réfutation des Erreurs de Spinoza*, which is a sympathetic exposition of Spinozism, and a *Vie de Mahomed*, equally anti-Christian in intention. Both works were posthumously published; and a (French) translation by him of Spinoza's *Ethica* was published by Colonna d'Istria in 1907.

Boulak. See BULÁK.

Boulanger, GEORGE ERNEST JEAN MARIE, a French general, was born at Rennes in 1837, and was educated at St Cyr. He served in Algeria, Italy, and Cochinchina; was with Bazaine at Metz, but escaped to Paris, and held a lieutenant-colonelcy under the Government of National Defence; in 1876 headed the deputation of French officers at the celebration of the centenary of American Independence; became brigadier-general in 1880 by the influence of the Duc d'Aumale; and in 1884–85 commanded the army of occupation in Tunis, till an arbitrary attempt to exalt the military over the civil authority led to his recall. He was wounded in action in Italy and during the Commune. He was minister of war from January 1886 to May 1887, urged forward the expulsion of the Duc d'Aumale and the other princes from France, and through the introduction of some desirable army reforms and the appearance of a fortunate music-hall song in his praise was adopted as the embodiment of the 'revenge' policy by the Parisians, who for some months suffered from what was termed the Boulanger fever. In 1887, while commanding an army corps at Clermont-Ferrand, he was, for his remarks on the war minister, ordered under arrest for thirty days. In March

1888, for disobedience to orders, he was deprived of his command, but was immediately elected deputy for Dordogne, and shortly thereafter for Nord. He was wounded in a duel with M. Floquet, the minister-president, in the same year. Boulangerism became still more formidable in 1889, and was supported with large sums of money by leading Royalists for their own ends. But when the government prosecuted Boulanger for intrigues against the republic and malversation of funds, he fled the country (1889). He was condemned in absence; his schemes wholly collapsed, and on 30th September 1891 he shot himself on his mistress's grave in a cemetery in Brussels.

Boulay de la Meurthe, ANTOINE, COUNT, a French statesman, born at Chaumouzey, in the Vosges, in 1761. He espoused the cause of the Revolution, but became known as the opponent both of Jacobinism and the despotism of the Directory. Under the Empire he had an important part in the preparation of the *Code Civil*. Returning in 1819 from Germany, he lived in retirement at Paris, where he died 2d February 1840. He published an essay on the *Commonwealth in England* (1799), and *Bourrienne et ses Erreurs* (1830).

Boulder, a city and health-resort of Colorado, 28 miles NW. of Denver, is centre of an agricultural and mining region, producing gold, silver, tellurium, and oil, and seat of the university of Colorado (1877); pop. 11,000.

Boulder, a municipality of Western Australia, adjoining Kalgoorlie; pop. 8000.

Boulder-clay is a stony clay which has a very wide geographical distribution. It occurs in the British Islands, as far south as the Bristol Channel and the valley of the Thames. It overspreads extensive areas in Scandinavia, Holland, Northern Germany, and Central and Northern Russia. In the lower valleys of the Alps, and many other mountain districts of Central and Southern Europe it is also well known. It has likewise been traced over vast regions in British America and the northern states of the Union. Boulder-clay varies in thickness from a few feet up to 20 or 30 yards—being generally thickest upon low-lying regions, and thinning away as it is followed up towards the mountains. It is unstratified, and contains stones scattered confusedly through its mass without any reference to their relative size and weight. These stones are of all shapes and dimensions, from mere grit up to great blocks several tons in weight. Many of them are blunted and subangular, and show on one or more sides that smoothed, abraded, and striated appearance which is characteristic of glacial action. The clay itself is generally more or less tough and hard, and has apparently been subjected to intense pressure, as is further shown by the presence now and again of a kind of 'pseudolamination' or 'pseudo-bedding,' often marked by differences of colour, and sometimes by lines of stones. These structures appear to be due to the shearing and yielding of the clay under pressure. Here and there lenticular patches of water-worn stones, and gravel, sand, and clay occur completely inclosed in the tumultuous stony clay—being confused, contorted, and involved with the latter in such a way as to show that they and the stony clay had been rolled forward upon each other. The included stones are more or less local in character—that is to say, the great majority in any individual sheet of boulder-clay have been detached from rocks belonging to the drainage area within which that particular sheet of boulder-clay occurs; while those fragments which have come from a greater distance can be shown to have travelled in one and the same direction as the locally derived stones and boulders. In like manner, the colour of

the clay is more or less local. Thus, in regions composed largely of red-coloured rocks, the boulder-clay is red; while it may be yellow, gray, or blue in other regions, according to the prevailing colours of the rocks upon or near to which it lies. Fossils have been met with at rare intervals in boulder-clay, but these are always derivative, and not unfrequently they are smoothed and striated in the same manner as the stones; in other words, they are boulders just as are the stones amongst which they lie. In many places, where the boulder-clay has been stripped off the underlying rocks, these are found to present a highly smoothed and abraded surface, streaked with rectilinear grooves and scratches, the trend or direction of which corresponds with that followed by the stones and boulders in the boulder-clay. Not unfrequently, however, the underlying rocks present a very shattered and confused appearance under the clay—larger and smaller masses being inclosed in the lower part of the boulder-clay—the bottom portion of which, indeed, is often entirely composed of the debris of underlying rock-masses, which have all the appearance of having been torn out of their places and dragged forward in the direction followed by the further-travelled blocks and boulders of the boulder-clay. In the lower reaches of mountain valleys, as in those of Britain, the Alps, the Pyrenees, &c., boulder-clay tends to form gently undulating or approximately level sheets or layers, which being cut through by streams or rivers, form more or less bold bluffs and scours. In some low-lying tracts, however, it is often arranged in long parallel banks known as ‘drums’ or ‘drumlins’—the general trend of which corresponds with that of the striae or scratches on the underlying rocks, and with the direction followed by the boulders in the boulder-clay. Excellent examples of *drums* occur in Nithsdale and in the lower valleys of the Teviot and the Tweed. In these and many other regions the boulder-clay is frequently found heaped up on one side of prominent rocky knolls and hills, the steep faces of which *front* the direction in which the boulders of the clay have travelled. This is the appearance called ‘crag and tail’—the tail being composed largely of boulder-clay. As examples may be cited Edinburgh Castle, Dalmahoy Crag, and other isolated hills near Edinburgh. The origin of boulder-clay, which has been the subject of much discussion, is now hardly in dispute. Boulder-clay is unquestionably the product of glaciation, and the phenomena mentioned above lead to the belief that this stony clay is simply the bottom-moraine or ground-moraine of extinct glaciers, which formerly had a most extensive development in the northern and temperate latitudes of the globe (see GLACIAL PERIOD, KALMES, MORAINES). Boulder-clay must not be confounded with the *marine* clays, which contain the remains of marine shells, &c. of arctic and northern species. These clays are usually more or less well bedded, and the stones contained by them have evidently been dropped from floating ice. Boulder-clay is known in Scotland as *Till*—a term which many geologists prefer, inasmuch as boulder-clay is often rather a stony earth than a clay. Formerly the terms *Diluvium* and *Drift* were used to designate boulder-clay and certain gravelly and arenaceous deposits frequently associated with that accumulation; but they are now seldom or never used. In the Alpine regions boulder-clay is known under the names of *Grund-moräne*, *Moraine profonde*, or *Moraine de fond*; in Germany it is called *Geschiebemergel*, *Geschiebelehm*, or *Blocklehm*; and *Krosstenslera* in Sweden.

Boulders, **ERRATIC**, are large masses of rock found at a distance from the formations to which they belong. The term is generally applied when they are found lying detached on the surface.

Large blocks of Scandinavian rocks are scattered over the plains of Denmark, Prussia, and Northern Germany. From their magnitude and number they frequently form a striking feature in the landscape. Some of these have been washed out of the Boulder-clay (q.v.), but the larger number are dotted over the surface of the terminal moraines of the great northern ice-sheet (see GLACIAL PERIOD). They abound on the shores of the Firth of Forth. Such boulders are simply the residue of the boulder-clay which has been denuded and washed away by the action of the sea. The pedestal of the statue of Peter the Great, in St Petersburg, was hewn out of a large erratic boulder, 1500 tons in weight, that lay on a marshy plain near that city. The boulder called *Pierre de Marmettes* at Monthey, in the canton of Valais, contains 70,630 cubic feet, and is



Erratic Boulder at Monthey.

large enough to have a chalet built on it. From the nature of the stone, it is believed to have been carried by glacier action a distance of 35 miles down the valley. On the other hand, the well-known ‘Boulder Stone’ of Borrowdale (q.v.) is simply a detached block, which has fallen from the adjacent crags.

Boulé, in ancient Greek states, was a council, oligarchic or democratic. In Athens the Boulé is said to have been established by Solon with 400 members (100 for each tribe), remodelled by Cleisthenes. Besides performing various administrative duties, the Boulé or its committees prepared business for the Ecclesia, and made recommendations.

Boule, or **BOULLE**. See **BUHL**.

Boulenger, **HIPPOLYTE** (1838–74), Belgian landscape-painter, was born at Tournay, and was distinguished not less for his refined draughtsmanship than for his delicate colour. He is well represented in the Brussels Gallery.

Boulevard (Fr., of Teutonic origin = Ger. *bollwerk*; cf. Span. *baluarte*, Ital. *baluardo*, ‘bulwark’), the name given in France to a broad street or promenade planted with rows of trees. Originally it was applied to the bulwark portion of a rampart, then to the promenade laid out on a demolished fortification. The boulevards of Paris are the most famous. The line from the Madeleine to the Bastille became a walk in the days of Louis XIV., and then a street. The so-called outer boulevards date from 1786, and were also old fortifications, levelled and planted. But many so-called recent boulevards in Paris and elsewhere are simply new and handsome streets, planted with trees, and have no relation to old fortifications at all. Some parts of them present a very dazzling spectacle; and, as a whole, they afford a striking exhibition of the life and character of the French capital in all the different classes

of society. The *Boulevards de la Madeleine*, des *Capucines*, and *Montmartre* are the most notable. The Thames Embankment is a boulevard in the usual sense of the term.

Boulogne-sur-Mer, a fortified seaport in the French department of Pas-de-Calais, situated at the mouth of the Liane, in the English Channel, 27 miles SW. of Calais, and 158 N. by W. of Paris by rail. The town consists of two parts—Upper and Lower Boulogne. The upper town was in former times strongly fortified; but its ramparts have been converted into beautiful promenades, from which, in clear weather, Dover Castle can be seen. The hôtel-de-ville occupies the site of the castle where Godfrey de Bouillon was born in 1061. The former cathedral, rebuilt (1827–66) in the Italian style, has a dome 300 feet high, and a miraculous image of the Virgin. The lower town, the seaport proper, is newer, more populous, and more lively, inhabited chiefly by merchants, mariners, and fishermen. It contains the barracks, the great hospital, the theatre, the museum and gallery of art, and many elegant residences. Boulogne has a college, several schools, English as well as French, and a public library; there are extensive and excellent salt-water baths; and, on account of its fine sands, it is a favourite, though somewhat expensive, resort for sea-bathing. The English residents are less numerous than formerly. Pop. (1872) 39,700; (1921) 55,336, actively engaged in the manufacture of linen, cordage, iron, steel pens and buttons, oil, soap, and chemical products. Boulogne is the chief station in France of the North Sea fisheries. It has an active coasting trade, and ranks with Calais as one of the nearest and most frequented places of passage between France and England. The principal imports are woollen, cotton, and silk material; the exports are manufactured fabrics, leather, and wine. The harbour of Boulogne has been repeatedly enlarged and improved. A large wet-dock was completed in 1872; and a new deep and extensive outer harbour was constructed in 1878–1904. The blue clay cliffs have been cut away, and a solid sea-wall built of the stone and soil; and the works, which have been steadily pushed forward, include outer moles and an inner mole or traverse. A dock deep enough to take the largest vessels was opened in 1912, and other extensive improvements to the harbour, including a new jetty and a new railway station, were undertaken about the same time. The whole French navy could find a haven in this harbour, where the largest ships may lie at anchor even at low-water. Boulogne was known to the Romans as *Portus Gesoriacus*, but after the time of Constantine the Great it was called *Bononia*, and after that of the Carolingians, *Bolonia*. In 1435 it came into the possession of the Duke of Burgundy, and it was united with the crown of France by Louis XI. in 1477. The town was taken by the English in 1544, and restored to the French in 1550. From this point has been contemplated every invasion of England since the days of Caligula; and here Napoleon encamped 180,000 men and collected 2400 transports, ready at any favourable moment to swoop down on the shores of Britain; but after months' watching, the war with Austria created other employment for them. As a memorial of this great camp, a tall marble column was erected on the higher grounds, and in 1841 surmounted by a colossal statue of Napoleon. In 1840 Boulogne was the scene of one of the adventurous expeditions of Louis Napoleon, who was imprisoned in the citadel. The poets Churchill and Campbell, and Le Sage, the author of *Gil Blas*, died here.

Boulogne-sur-Seine, a town of France, in

the department of Seine, on the right bank of the river Seine, about 5 miles SW. of Paris, from which it is separated by the Bois de Boulogne. It has numerous villas, and hundreds of wash-houses on the river, which is here crossed by a fine stone bridge of twelve arches. Pop. 68,000. The Bois de Boulogne is traversed by many walks, through the broadest of which the fashionable world of Paris travels in Easter-week to the Abbey of Longchamp. At the entrance of the wood lies Auteuil (q.v.). During the Revolution the trees of the older walks were mostly cut down; but when Napoleon chose St Cloud, in the immediate neighbourhood, for his summer residence, new walks were planted and laid off, and the enclosing walls were restored. The Bois again became a scene of desolation during the siege of 1870–71, but this favourite place of recreation was soon restored to its former beauty and popularity.

Boulton, MATTHEW, a celebrated English engineer, was born 3d September 1728, at Birmingham, where his father had made a considerable fortune as a silver stamper and piercer. On his death in 1759, Matthew carried on the business with great energy, and extended it by the purchase of a piece of land, then a barren heath, at Soho, near his native town, his works there being opened in 1762. Here he improved not only the workmanship, but the artistic merit of his work. One of his first inventions was a new mode of inlaying steel. He entered into partnership with James Watt (q.v.), who had obtained a patent for his great improvements in the steam-engine, and they established a manufactory of steam-engines in 1774. After eighteen years of anxious labour, this department of the business began to be remunerative. They jointly contributed also to the improvement of coining machinery, and so of the coinage itself. It was only in 1882 that a Boulton press, at the Mint, Tower Hill, was finally discarded. Boulton obtained a patent in 1797 for his method of raising water by impulse. He died at Soho, 18th August 1809. His long life was devoted to the promotion of the useful arts and of the commercial interests of his native country. He was a Fellow of the Royal Society, and member of the Lunar Society, and was on terms of friendship with the chief scientific and literary men of his time; he was a man of extremely pleasing conversation, and of a most generous disposition. See Smiles's *Lives of Boulton and Watt* (1865).

Bound, or BOUNDARY, the utmost limits of land by which the same is known and can be described. These are recognised in various ways—e.g. by a line of march stones, a hedge, a ditch; by reference to possession of tenants; by reference to a plan; by measurement. The plan is the safest, because least ambiguous, boundary. A boundary-fence generally belongs equally to the two neighbours. A boundary by the sea gives property in the foreshore (see BOUNDING CHARTER). The boundaries of towns depend in many cases on those of a grant of lands or jurisdiction anciently made to the town. The Reform Acts of 1832–33, 1867–68, and 1884–85, or commissions acting under them, defined the boundaries of many boroughs for the purposes of parliamentary elections; but these are in many cases different from the municipal boundaries. Municipal boundaries may be altered by a local act, or by an order of the Ministry of Health or the Board of Health confirmed by parliament. A county council has power to adjust the local government areas within the territory which it is elected to administer—e.g. to define the boundaries of the district of an urban or rural council. Parishes may be united by the Ministry of Health or the Board of Health or by the county council, which

has also power to transfer a part of one parish to another. Provision is made in the Local Government Act, 1894, for the adjustment of property, income, and liabilities in case of alteration of boundaries by such orders of a county council. In Scotland the Court of Teinds has power to alter the boundaries of an ecclesiastical parish, and to unite and create parishes. Boundary commissioners, under the Local Government Act, 1889, have settled the boundaries of counties and parochial areas in Scotland for administrative purposes. But there remain with the Secretary for Scotland large powers, on the recommendation of a county council or town council, to alter the area of any county, burgh, or parish for civil purposes. In the United States the determination of the boundaries of the several states lies, under the constitution, with the Supreme Court of the United States.

Bounding Charter, in the Scots law, is a charter which describes the lands by their boundaries. It gives right to everything within the bounds, but it prevents the acquisition by possession of any piece of property outside the bounds, even although the charter contains a clause of parts and pertinents. This rule, however, does not apply to servitudes, which can be acquired beyond the limits of a bounding charter, nor to such an incorporeal right as salmon-fishing. If the boundary be the sea or the seashore, the right is extended or limited as the sea permanently recedes or advances. If, again, it be a stream, the property may be subject to alteration, either extended by Alluvion (q.v.), or the gradual and imperceptible variation of the channel; or the stream may cease to be the boundary, in consequence of some violent change. But if the property described in the charter is bounded by walls, the walls, as a general rule, will not be held as included in the grant; and where it is intended that a wall is to be mutual, this must be expressed. When the grant is described both by boundaries and by measurement, the boundaries determine its extent, although containing a larger quantity of ground than the measurement. See CHARTER, CONVEYANCE, GRANT, and TITLE.

Bounds, BEATING OF THE, or *Perambulation*, the popular expression in England for those periodical surveys or perambulations by which the ancient boundaries of parishes used to be preserved, and which in many respects resembled the old Roman *terminalia*, celebrated every year on February 23, the last month of the year. On Holy Thursday or Ascension-day, the clergyman of the parish, with the parochial officers and other parishioners, followed by the boys of the parish school, headed by their masters, used to go in procession to the different parish boundaries, which boundaries the boys struck with peeled willow-wands that they carried in their hands. Sometimes the boys were whipped at important points 'to make them remember.' At Shrewsbury the bounds-beating was called *Banner-ing*, and was kept up annually to the middle of the 19th century. At Ludlow it still retained its religious character in 1822. For an account of the ceremonies, see Brand's *Popular Antiquities*, under 'Rogation Week and Ascension Day.' The custom is not confined to England. See Mackenzie Wallace's *Russia*.

Bounty, a term applied to any sum granted by the legislature towards creating or encouraging some kind of undertaking believed to be of national importance. At one time the system of granting such bounties was very prevalent, and it still continues in some countries. There were bounties on the tonnage of vessels employed in the herring and whale fisheries; on the importation of materials of manufactures; on the importation of indigo from

the colonies; on the exportation of Irish and Scottish linen. That this system was a costly and factitious process for fostering commerce, manufactures, and agriculture was ably contended by Adam Smith in his *Wealth of Nations* (1776). With regard to the herring-fishery in particular, the drift of his remarks is to show that in consequence of the bounty the herrings cost more to the government than the price they fetched in the market. The bounty on linen, which was not abolished till 1830, had before that time averaged £150,000 a year. The bounty on the exportation of grain from England, abolished in 1814, had for some years averaged £160,000. The French still give bounties to encourage their cod-fishery on the Banks of Newfoundland, and are second only to Japan in bounties on shipping. In 1911 the Japanese and French bounties on shipping were £1,400,000 and £1,335,000 respectively. The most important form of the recent bounty system was that on beet-sugar, long maintained in Germany, France, Austria, Holland, and Belgium. The bounty on sugar was not a direct one, but was paid on the principle of returning on exportation the sum charged as inland duty. In consequence of mechanical improvements, the quantity of sugar actually extracted from the beet-root was greater than the estimated yield on which duty is paid. Thus the government paid as drawback a sum greater than it received as revenue, and, accordingly, spent a considerable amount in artificially encouraging the production of sugar. The annual average of sugar bounties in 1887-90 was in France about £600,000, in Belgium £170,000, in Holland £150,000. In 1901-2 a conference at Brussels, representing Austria-Hungary, Belgium, Britain, France, Germany, Italy, Netherlands, Spain, and Sweden, adopted a convention suppressing direct and indirect bounties on sugar production and export. The bounty designed to stimulate exportation must be distinguished from the Drawback (q.v.), meant to put in a fair position for exportation those commodities more heavily taxed at home than abroad. For proposals to extend bounties in this country, see Final Report of the Committee on Commercial and Industrial Policy after the War (1918); and for criticism, *The New Tariffism*, by J. M. Robertson (1918). See FREE TRADE.

An annual grant of £2000 to the Church of Scotland for mission purposes is called the Royal Bounty. Another annual grant called the Royal Bounty has long been given in Britain for improving the breed of horses. It had been generally expended in prizes at race meetings; but a Royal Commission in 1887 recommended that it should be given in prizes for thoroughbred stallions at horse-shows. The name King's Bounty is popularly given to a charitable donation bestowed on the mother of triplets. For Queen Anne's Bounty, see that article.

Bounty is also the familiar name for the sum of money given to induce men to enter the army or navy, or to continue their service after their engagement is completed. In time of peace, or when there is little or no need to augment the forces, the bounty sinks to a minimum or disappears. In the British army no bounty was paid to recruits until the 19th century; the temptations offered to them, if any, were of some other character. The highest bounty ever paid during the great wars against Napoleon was in 1812, when it amounted to £18, 12s. 6d. for limited service, and £23, 17s. 6d. for life; but these sums were subject to many unfair and absurd deductions; and even so late as 1849, when the bounty to an infantry recruit was nominally £4, he received little more than one-eighth of that amount. In 1855 the bounty was £7 per head (for line infantry); in

1856, only £2; in 1858, £3; and it afterwards underwent further changes. It was always higher in the cavalry and artillery than in the infantry, and higher in Highland than other line regiments, on account of matters connected with dress and personal ornaments. It was supposed that recruits were tempted more by immediate bounty than by prospective pay and pensions; so that while the rate of bounty varied frequently, that of pay and pensions underwent little change. The term bounty is also used in the navy to signify the distribution of money made to officers and men on particular occasions of active service. See **BOOTY**, **PRIZE**, **SALVAGE**.

In France and Germany considerable bounties have had to be offered to soldiers to induce them to serve in the colonies.

In the United States the term has a like width of application for grants to induce men to enter the army (as much sometimes as \$1000 during the stress of the Civil War), the sum paid to a war-vessel that sinks or destroys an enemy's ship, and grants of land to soldiers and sailors, their widows and children, for services in the army and navy; as also for sums of money paid by government to owners of fishing-vessels for the encouragement of that industry, and to sums appropriated by state legislatures for the destruction of wild beasts and destructive birds, when the country was comparatively new and sparsely settled. See also **PENSIONS**.

Bounty, **MUTINY OF THE**. See **PITCAIRN ISLAND**, **BLIGH**.

Bouquetin. See **IBEX**.

Bourbaki, **CHARLES DENIS SAUTER**, French general, born at Pau, 22d April 1816, entered the army in 1836, and fought in the Crimea and Italy. In 1870 he commanded the Imperial Guard at Metz, from whence he was sent to England, on a secret mission to the empress. Under Gambetta he organised the Army of the North, and commanded the Army of the Loire. His attempt to break the Prussian line at Belfort, though ably conceived, ended in disastrous failure; in a series of desultory attacks on a much inferior force, January 15-17, 1871, he lost 10,000 men. In the wretched retreat to Switzerland that followed on the 27th, reduced to despair by the ill-success of his plans, he attempted to commit suicide. In 1873-79 he commanded the 14th Army Corps at Lyons, and in 1881 he retired. He died 18th September 1897.

Bourbon, a French family which for several generations occupied the thrones of France and Naples, and still rules in Spain. It derived its name from the castle and seignior of Bourbon, in the former province of Bourbonnais, in the centre of France. The first member of the family recorded in history was Adhèmar, sire or lord of Bourbon, at the beginning of the 10th century, who traced his descent from the illustrious Charles Martel. After several changes the seignior of Bourbon devolved upon an heiress, who in 1272 married Robert, the sixth son of Louis IX. of France, and the name and possessions of the house thus passed to a branch of the royal family of the Capets, under whom it was converted into a duchy. From this Robert sprang two lines, an elder and a younger. The elder line had many eminent representatives among the nobles of France, but ended with the famous Constable of Bourbon, who in 1523 was deprived of his possessions and dignities for allying himself with Charles V. against his own country.

A representative of the younger line inherited the possessions of the Constable, and was raised to the dukedom of Vendôme. His son, Antoine, obtained by marriage the throne of Navarre, and Antoine's son was the famous Henry of Navarre, who in 1589, on the extinction of the male line of

the House of Valois, fell heir to the crown of France. Among the many collateral and less eminent branches of the Bourbon house among the French nobility may be mentioned those of Montpensier, Condé, Conti, and Soissons. Only a few members of the collateral lines, however, have actually borne the name of Bourbon; for example, the Cardinal Charles de Bourbon, Duke of Vendôme, who, under the name of Charles X., was set up by the Catholic League as a rival king to Henry IV. The ducal dignity was revived by Louis XIV. in the House of Condé, so that the eldest son of that house should bear the title of Duke of Bourbon.

Main Line of the House of Bourbon.—As we have seen, the male line of the Valois branch of the French royal family died out in 1589, and Henry of Navarre of the Bourbon line became king of France as Henry IV. On his assassination in 1610 he left, by his second wife, Mary de' Medici, five legitimate children: (1) Louis XIII. (q.v.), his successor on the throne; (2) J. B. Gaston, Duke of Orleans (q.v.), who died in 1660, and left no male heirs; (3) Elizabeth, married to Philip IV. of Spain; (4) Christina, married to Victor Amadeus, afterwards Duke of Savoy; (5) Henrietta, married to Charles I. of England.—Louis XIII., on his death in 1643, left two sons by his queen, Anne of Austria: (1) Louis XIV. (q.v.), his successor; and (2) Philip, who received from his elder brother the title of Duke of Orleans, and was the founder of the family which has become the younger Bourbon dynasty.—The Dauphin Louis, styled Monsieur, the son of Louis XIV. by his marriage with Maria Theresa of Austria, died in 1711, and left three sons by his marriage with Maria Anna of Bavaria: (1) Louis, Duke of Burgundy; (2) Philip, Duke of Anjou, who afterwards became king of Spain, as Philip V.; (3) Charles, Duke of Berri, who died in 1714.—Louis, Duke of Burgundy, died in 1712. By his wife, Maria Adelaide of Savoy, he had three sons, of whom two died in early youth, the only one who survived being Louis XV., who succeeded his great-grandfather, Louis XIV., in 1715.—Louis XV. having married Maria Leszcynska, daughter of the dethroned king Stanislaus of Poland, had by her a son, the Dauphin Louis, who married Maria Josepha of Saxony, and died in 1765, leaving three sons: (1) Louis XVI. (q.v.), who succeeded his grandfather, Louis XV., in 1774; (2) Louis Stanislaus Xavier, Count of Provence, afterwards Louis XVIII.; (3) Charles Philippe, Count of Artois, afterwards Charles X.—Louis XVI. had three children by his queen, Marie Antoinette of Austria: (1) The Dauphin Louis, who died in 1789; (2) Louis, called Louis XVII. (q.v.), who died in 1795; (3) Maria Therese Charlotte, styled Madame Royale, afterwards Duchesse d'Angoulême (q.v.).—Louis XVIII. had no children; but Charles X. had two sons: (1) Louis Antoine de Bourbon, Duke of Angoulême (q.v.), who was dauphin prior to the Revolution of 1830, and died without issue in 1844; (2) Charles Ferdinand, Duke of Berri (q.v.), who was assassinated in 1820. The Duke of Berri left two children: (1) Marie Louise Therese, styled Mademoiselle d'Artois, married to the Duke of Parma; (2) Henry Charles Ferdinand Marie Dieudonné, Duke of Bordeaux, styled Count de Chambord (q.v.); he died childless in 1883, when the Legitimists of France accepted in his room the Orleanist Comte de Paris as head of the House. See **ROBINET DE CLÉRY**, *Les Deux Fusions* (1908).

Orleans Branch.—As already stated, the founder of the Orleans or younger branch of the Bourbon royal family of France, was Philip, Duke of Orleans (q.v.), the only brother of Louis XIV. He died in 1701, leaving, by his second marriage with Elizabeth Charlotte of the Palatinate, a son of his

own name as his heir, who was Regent of France during the minority of Louis XV. His son, Louis-Philippe, Duke of Orleans (born 1703), married a princess of Baden, and died in 1752, leaving an only son of his own name, whose son and heir was that Louis Joseph Philippe, Duke of Orleans (q.v.), so notable in the French Revolution, who in 1792 renounced his rank, taking the name of Citizen Egalité, and died by the guillotine in 1793. He left four children: (1) Louis-Philippe, who, before the Revolution, was styled Duke of Chartres—that being the ordinary title of the eldest son of the Orleans family—became afterwards Duke of Orleans, was king of the French from 1830 to 1848, and died in England, 1850; (2) the Duke de Montpensier, who died in England in 1807; (3) the Count de Beaujolais, who died at Malta in 1808; (4) Adelaide, styled Mademoiselle d'Orleans, born 1777, died 1847.—Louis-Philippe left a numerous family by his queen, Amelia of Naples; but his eldest son, Ferdinand, Duke of Orleans, lost his life by an accident in 1842, leaving by his wife, the Princess Helen of Mecklenburg-Schwerin, two sons, the eldest of whom, Louis-Philippe, styled Count of Paris, was at his death (1894) the representative of the Orleans family, and head of the House of Bourbon. His son Louis-Philippe Robert was already known as Duke of Orleans. As pretenders to the throne, the chiefs of the Orleans family were expelled from France in 1887. See the article LOUIS-PHILIPPE, the articles on the kings of this family, the works quoted at FRANCE, and the family history by Coiffier de Moret (2 vols. 1824).

Spanish Branch.—The Spanish branch of the House of Bourbon was founded by Philip, Duke of Anjou, grandson of Louis XIV. He ascended the Spanish throne in 1700 as Philip V. Philip V. was succeeded on the Spanish throne by his son, Ferdinand VI., who died without issue in 1759, and the crown fell to his brother, Charles III., whose son and successor, Charles IV., was compelled to resign it in 1808 in favour of a successor nominated by Napoleon, and died at Naples in 1819. The two eldest sons of Charles IV. by his marriage with Maria Louisa of Parma were—(1)

Don Fernando, Prince of Asturias, who, after the overthrow of Napoleon, reigned as Ferdinand VII. (q.v.), whose eldest daughter was Isabella II., the mother of Alfonso XII.; (2) Don Carlos, who, on the death of his elder brother in 1833, became pretender to the Spanish throne (see CARLOS). Isabella II., who succeeded in 1833, was expelled in 1868; but the Bourbon line was in 1874 restored to the throne of Spain in the person of Alfonso XII. On his death in 1885 his daughter Maria reigned till the birth of a posthumous son, Alfonso XIII., in 1886. See SPAIN.

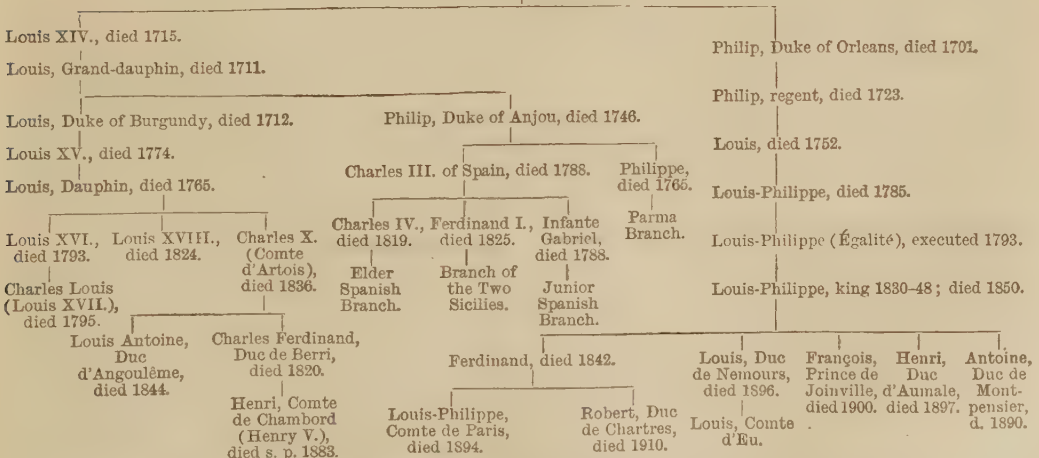
Neapolitan Branch.—On the elevation of Philip of Anjou to the throne of Spain, Naples and Sicily, which till that time had been Spanish possessions, were transferred to Austria. By the Peace of Vienna in 1738, however, a younger son of Philip V. became king of Naples and Sicily, under the name of Charles III. Upon his accession to the throne of Spain in 1759, he gave up that of Sicily to his third son, Don Fernando, called Ferdinand IV., with the express stipulation that it should never again be occupied by a king of Spain. Ferdinand IV. was compelled to yield to the French arms in 1806; but after the overthrow of Napoleon he became king of the Two Sicilies as Ferdinand I. (q.v.). His son, Francis I., left the throne in 1830 to his son, Ferdinand II. (q.v.), whose son, Francis II., was expelled in 1860, when Naples was incorporated with the new kingdom of Italy. See NAPLES.

Parmese Branch.—By the peace of Aix-la-Chapelle in 1748, Austria made over the duchies of Parma and Piacenza to Don Philip, the youngest son of Philip V. of Spain. Except during the interval 1814-47, when the duchies were assigned to Marie Louise of Austria, second wife of the first Napoleon, Parma and Piacenza were under Bourbon rulers till 1859. In that year they were incorporated with the new kingdom of Italy. See ITALY and PARMA; and see Coiffier de Moret, *Histoire du Bourbonnais* (1828); Achaintre, *Histoire de la Maison de Bourbon* (1825); Bingham, *The Marriages of the Bourbons* (1889); also histories by Mure (Paris, 1860-68) and Dussieux (1869).

THE HOUSE OF BOURBON.

Henry IV., died 1610.

Louis XIII., died 1643.



Bourbon. CHARLES, DUC DU BOURBONNAIS, styled CONSTABLE DE BOURBON, born 1490, was the son of the Count of Montpensier. Through the death of his elder brother, and his marriage with the only daughter of the Duke of Bourbon, he united in his own hands the vast estates of both

these branches of the Bourbon family. His great ability, bravery, and large possessions soon made him the first subject of France. For his exploits at the battle of Marignano in 1515 he was raised to the rank of Constable of France and governor of Milan. But at the French court there was a strong

party that sought to undermine him in the favour of the king, Francis I. It is said that they were assisted in their intrigues by the widowed mother of Francis, because Bourbon, himself then a widower, had refused her hand. In this way Bourbon was threatened with the loss of the lands brought him by his wife, and of many of his other dignities. Deeply injured, he renounced the service of France, and concluded a private alliance with the Emperor Charles V., and with Henry VIII. of England. The former agreed to give him in marriage his sister, Eleonora, who had Portugal as her jointure, and to make an independent kingdom for him of Provence and Dauphiné, with his own possessions of the Bourbonnais and Auvergne. The king, who was engaged in an expedition to Italy, received intelligence of this conspiracy, and proceeding in person to the Constable, offered him restoration to favour and also of his estates. The Constable, however, did not trust him, but fled in disguise from France in 1523. In order not to appear as a fugitive to the Spanish army, which awaited him in Lombardy, he drew around him a force of German mercenaries, and soon contrived to gain their entire attachment. He took the field in 1524 against his own country, and invaded France, but failed at the siege of Marseilles. In the following year, however, he contributed to the great victory of Pavia, in which Francis I. was taken prisoner by the Spaniards. But the victory did nothing to restore Bourbon to his old position. Charles V. distrusted him, and his interests were not considered in the treaty of peace between France and Spain in 1526. He was, however, made Duke of Milan by Charles, and appointed Spanish commander in Northern Italy. Along with George of Frundsberg he led the mixed army of Spanish and German mercenaries that stormed and plundered Rome in 1527. Bourbon fell in the fierce struggle by which the fortifications were carried. Resolved to conquer or die, he led his troops in the most impetuous manner, and with his own hands eagerly seized a scaling-ladder, in order to make his way over a weak place of the walls, when he was mortally wounded by a bullet, which Benvenuto Cellini afterwards asserted that he had shot. For a time his death was kept secret from the storming army under his command. When the army departed from Rome two months after, his corpse, which the soldiers would not part with, was taken with them, and buried at Gaeta, under a magnificent monument, which, however, was afterwards destroyed.

Bourbon, ISLE DE. See RÉUNION.

Bourbonnais, a gently undulating, terrace-formed district in the centre of France, northward of the high lands of Auvergne, abounding in grain, fruits, wine, iron, marble, and mineral springs. From 1327 to 1523 it formed the duchy of Bourbon, and afterwards, becoming a domain of the crown, it formed a separate province of France. It now constitutes the department of Allier and part of the department of Cher. The capital was Moulins.

Bourbonne-les-Bains, a town in the French department of Haute-Marne, 29 miles ENE. of Langres. From June to October it is much visited for its saline springs, which reach a temperature of over 130° F., and are efficacious for rheumatism, wounds, scrofulous affections, and digestive ailments.

Bourboule, a bathing-resort in the French department of Puy de Dôme, on the Dordogne, with springs of 88°–129° F., recommended in scrofulous, nervous, and rheumatic affections.

Bourdaloue, LOUIS, one of the greatest pulpit orators of France, was born at Bourges, 20th August 1632. At sixteen he entered the

order of the Jesuits, and afterwards filled in succession the chairs of Rhetoric, Philosophy, and Moral Theology in the Jesuit College of his native place. But his remarkable powers of eloquence determined his superiors to employ him as a preacher. Disdaining the inflated and theatrical style prevalent among the pulpit orators of his time, he assailed with fearless vigour and simple earnestness the passions, weaknesses, and errors of men. The dignity of his manner and the fire of his eloquence made him famous even when the public mind was occupied with the festivities of Versailles, the victories of Turenne, and the literary masterpieces of Corneille and Racine. At the court of Louis XIV. he was remarkably well received. The year after the revocation of the Edict of Nantes, he was sent to Montpellier to bring back the Protestants to the Roman Catholic Church. The orator understood how to accommodate his eloquence to the minds of those whom he addressed. Simple among the simple, a dialectician among ecclesiastics, he was equally a favourite with the common people and with the learned and the great. He was also much esteemed and beloved as a man, and bore throughout his life a high reputation for candour and honesty. In the later years of his life he relinquished the pulpit, and devoted his time to hospitals, prisons, and pious institutions. He died at Paris, 13th May 1704. The best edition of his sermons was edited by Bretonneau (16 vols. 1704–37). See books by Lauras (1881), Feugère (1888), Chérot (1898–99), Griséle (1901), and Castets (1901–4).

Bourdon de l'Oise, FRANÇOIS LOUIS, was born in the middle of the 18th century at Saint Remy, near Compiègne. He was a fanatical revolutionist, took an active part in the storming of the Tuileries on 10th August 1792, and under a false name obtained a seat in the Convention. Bourdon contributed to bring about the execution of Louis XVI. and the destruction of the Girondists. In La Vendée, however, he objected to the cruelties of the extreme party, and thus became suspected by the followers of Robespierre, whom he helped to overthrow in 1794. From that time he inclined more and more to the moderate or even royalist party, till in 1797 the Directory had him proscribed and transported to Cayenne, where he died soon afterwards. See Thiers, *Histoire de la Révolution*.

Bourgas. See BURGAS.

Bourgelat, CLAUDE, veterinary surgeon, was born in Lyons in 1712, and died there in 1799. An ex-cavalry officer, he in 1761 founded (at Lyons) the first veterinary school, and students flocked to it from all parts of Europe. Its success induced the government to establish similar institutions, and Bourgelat was chosen to superintend that at Alfort, near Paris, which became the most celebrated school in France. Bourgelat wrote with authority on farriery.

Bourg-en-Bresse, the chief town of the French department of Ain, on the Reyssouze, at the junction of five railways, 23 miles SE. of Mâcon, and 37 miles NE. of Lyons. The church of Notre-dame de Brou here was built by Margaret of Austria in 1505–36, and contains a superb monument to Philibert of Savoy. Bourg manufactures artificial mineral waters, boilers, and pottery, and has a brisk trade in corn, wine, poultry, and horned cattle. Here were born Lalande and Edgar Quinet, and in the Place de Grenette stands a statue to Bichat. Pop. 20,000.

Bourgeoisie, a French term, originally denoting the citizens of towns as a rank or class of society as opposed to the nobility and the working-classes proper. The French communists and socialists (especially since Saint-Simon) have

widened its signification to express the more or less comfortable middle-class as opposed to the working-class and the proletariat; and, moreover, invariably read into the name a one-sided, narrow-hearted, and selfish devotion to the interest of capital as against labour.

Bourges, the capital of the French department of Cher, situated in a fertile plain at the confluence of the Auron and the Yèvre, 144 miles S. of Paris, and 69 SSE. of Orleans. Bourges is divided into an old and new town, the latter being built round the former. Its houses are of antique architecture, and its streets crooked and dirty. It was formerly surrounded by ramparts flanked with high towers, some of which still remain; but the ramparts have been converted into promenades. The cathedral (1220-1538) is a splendid Gothic edifice, the interior one of the noblest in France, being 405 feet long and 117 high. The sculptures of the west façade are admirable, and there is some very good stained glass. A university (1465) was suppressed at the Revolution. The hôtel-de-ville, formerly Jacques Cœur's house (c. 1443), is in the florid style of its century. Bourges has prospered since the era of railway communication, and has some trade in hemp, grain, cloth, leather, wool, and cattle. Brewing is carried on, and there are nurseries in the suburbs. Chosen in 1861 to be one of the military arsenals of France, Bourges has a cannon-foundry, and greatly increased in importance after the loss of Metz. Pop. (1872) 27,377; (1911) 45,735; (1921) 45,942. Bourges is of great antiquity, being the *Avaricum* of the Gauls, in the country of the *Bituriges Cubi*. Taken by Cæsar in 52 B.C., it became the capital of the Roman province of *Aquitania Prima*, and in the middle ages, of the province of Berri. Charles VII. had his residence at Bourges, when almost all France had been taken from him by the English. Louis XI. was a native, as was also the great preacher Bourdaloue. Several important ecclesiastical synods were held at Bourges.

Bourget, LE, a village 6½ miles NE. of Paris by rail, during the siege of the capital in 1870 the scene of a series of bloody struggles disastrous to the French, of which the most important were those of 30th October and 21st December.—The Lac du Bourget, the largest wholly French lake, in the department of Savoie and the basin of the Rhone, lies 780 feet above sea-level, and measuring 7½ by 3 miles, has an area of 16 sq. m.

Bourget, PAUL, an eminent novelist and critic, born at Amiens, September 2, 1852. After a brilliant course at the Lyceum of Clermont-Ferrand, where his father was professor of Mathematics, and the college of Sainte Barbe, he graduated with the highest honours in 1872. His early distinctions pointed to an academical career, but the spell of literature proved too strong. He began to write in 1873, but it was ten years ere he found his true work, though he contributed the while numerous articles to the magazines, and published as many as three volumes of striking verse: *La Vie Inquiète* (1875), *Édel* (1878), and *Les Avenex* (1881). His *Essais* (1883) was the first indication of his strength. The second series, *Nouveaux Essais de Psychologie contemporaine* (1886), was a singularly subtle and searching inquiry into the causes of pessimism in contemporary France. Bourget's first novel, *L'Irréparable* (1884), was followed by *Cruelle Énigme* (1885), *Un Crime d'Amour* (1886), *André Cornélis* (1887), and *Mensonges* (1887). The keen insight into the hidden springs of human motive, and the marvellous subtlety of psychological analysis in these stories, together with their clearness and refinement of style, have lifted Bourget into the front rank of contemporary French novelists. His intimate knowledge of English and

Italian life, and his travels in Spain and Morocco, gave him the materials for *Sensations d'Italie* (1891) and *Cosmopolis* (1892); and he recorded his impressions (1894) of travel in the United States. His works include *Le Disciple*, *Notre Cœur*, *La Terre Promise*, *Un Saint*, *Un Scrupule*, *Un Idylle Tragique*, *Voyageuses*, *Recommencements*, *Complications*, *Sentimentales*, *La Duchesse Bleue*, *Drames de Famille*, *Le Fantôme*, *Monique*, *L'Étape*, *Un Divorce*, *Le Démon de Midi*, *Lazarine*, *Anomalies*, *Nouvelles Pages de Critique et de Doctrine* (1922)—the later works written from a Roman Catholic point of view. He was admitted to the Academy in 1894.

Bourignon, ANTOINETTE, a celebrated religious visionary, born at Lille, 13th January 1616. She early fancied she saw visions, received special revelations, and was called to restore the pure spirit of the gospel. At twenty she fled to a convent. She afterwards had charge of a hospital at Lille, but from this position she was driven to Ghent (1662) in consequence of her extravagant fancies. She now travelled to gain proselytes, and for a time was head of a hospital in East Friesland. She died at Franeker, 30th October 1680. According to Madame Bourignon, religion consists in internal emotion, and not in either knowledge or practice. Her own character exhibited a strange combination of pride and avarice, with a sort of mystic piety. Among the chief expounders of Bourignonism, as this form of mysticism was called, was Peter Poiret, a Calvinistic minister. It spread to a remarkable extent, and about the beginning of the 18th century prevailed so much in Scotland that till 1809 a renunciation of it was demanded from every entrant on the ministry at his ordination. The works of Madame Bourignon were edited by Poiret (25 vols. Amsterdam, 1676-84; 2d ed. 1717). There are English translations of her *Light of the World* (1786), *Treatise of Solid Virtue* (1699), and *Restoration of the Gospel Spirit* (1707). See a monograph on her by Professor A. R. MacEwen (1909).

Bourmont, LOUIS DE GHAINES, COMTE DE, a French marshal, the conqueror of Algiers, was born in 1773 at his paternal castle of Bourmont, in Anjou. He went into exile at the Revolution, and from 1794 to 1799 was actively engaged in the anti-revolutionary struggle in La Vendée. Subsequently, he obtained the favour of Napoleon, and for his brilliant services in the campaigns of 1813-14 was promoted to the rank of general. In March 1814 he declared for the Bourbons; yet, on Napoleon's return from Elba, he went over to him, only once more to desert on the eve of the battle of Ligny, and to betake himself to Louis XVIII. at Ghent. His evidence went far to bring about Ney's execution. He was appointed minister of war in 1829, and in 1830 received the command of the expedition against Algiers, whose rapid success was ascribed to his prudence and energy. For this he received the marshal's baton, but on the July revolution he was superseded, and went to England to share the exile of Charles X. Refusing to take the legal oath, he was struck off the lists of the French army and peerage in 1832. In 1833 Dom Miguel of Portugal placed him at the head of his troops, but the campaign was brief and unsuccessful. Bourmont finally settled on his estate in Anjou, and died there 27th October 1846.

Bourne, HUGH, the founder of the sect of Primitive Methodists (q.v.), was born 3d April 1772, at Fordhays, parish of Stoke-upon-Trent, Staffordshire, and died at Bemersley, 11th October 1852. At first an assistant to his father, who was a farmer and wheelwright, and to an uncle, he became a preacher among the Wesleyan Methodists. His zeal for large open-air meetings, carried on on

one occasion from six in the morning till eight at night, received no countenance from the leaders of the denomination to which he belonged; and in 1808 Bourne was cut off from the Wesleyan connection for continuing to hold camp meetings in defiance of the repeatedly and strongly expressed disapproval of the Wesleyan Conference. But his preaching was wonderfully acceptable, and he quickly gathered round him many devoted adherents. In March 1810 a committee of ten members was formed at Standley, near Bemersley. This may be regarded as the first official organisation of the body which adopted the name Primitive Methodist in 1812; by the people they were sometimes called Ranters. Bourne and his brother founded the first chapel of the body at Tunstall in 1811. For the greater part of his life he worked as a carpenter and builder, but found time to visit Scotland, Ireland, and the United States. Amongst his writings was a *History of the Primitive Methodists* (1823).

Bourne, VINCENT, Latin poet, was born in 1695, from Westminster passed in 1714 to Trinity College, Cambridge, and after obtaining a fellowship in 1720, became a master in his old school. Such he remained till his death on 2d December 1747. Cowper, one of his pupils, expressed his 'love for the memory of Vinny Bourne,' and actually thought him 'a better Latin poet than Tibullus, Propertius, Ausonius, or any of the writers in his way except Ovid, and not at all inferior to him.' And Lamb, more happily, remarks: 'What a sweet, unpretending, pretty-mannered, matterful creature! Sucking from every flower, making a flower of everything. His diction all Latin, and his thoughts all English!' The best edition of his *Poemata* (1734) is that with a memoir by Mitford (1840).

Bournemouth, a town in Hampshire, a favourite health resort, on Poole Bay, 37 miles SW. of Southampton, and 116 of London. Its rise has been rapid; until 1838 it consisted of but a few fishermen's huts and a coastguard station. It is situated for the most part in the pine-clad valley of the Bourne Brook, the banks of which are laid out as public gardens. The sands extend for about 3 miles from east to west. The climate is fine, the air soft without being relaxing, and the country around is beautiful. Two piers, one 800, the other 840 feet long, were erected in 1861 and 1879. Of several churches the finest is St Peter's (1864), by Street, with memorial windows to Keble, and the graves, in its churchyard, of Godwin, Mary Wollstonecraft, and Mary Shelley. There are numerous sanatoriums, an art-gallery, a winter-garden, &c. Pop. (1861) 1940; (1881) 16,858; (1891) 37,650; (1901) 47,003; (1911) 78,674; and in 1921, 91,770. The town was made a municipal borough in 1890, and a county borough in 1900, a parliamentary borough in 1918. Its centenary was celebrated in 1910 (the first villa dating from 1810).

Bouroudjird, a town of Persia, 190 miles NW. of Isfahan; pop. 12,000.

Bourrienne, LOUIS ANTOINE FAUVELET DE, the secretary and early friend of Napoleon I., was born at Sens in 1769, and received his education in the military school at Brienne, where he formed the closest intimacy with the future emperor. In 1792 he became secretary to the embassy at Stuttgart. Deprived of this office through the breaking out of the revolutionary wars, he lived a retired life for some time, until in 1797 his former schoolfellow appointed him his secretary. He accompanied him to Italy and to Egypt, and in 1801 was nominated a councillor of state. In 1802 he was dismissed from his office for being implicated in the dishonourable bankruptcy of the house of Coulon, army contractors; but in 1804

he was appointed to a post at Hamburg. He was recalled on a charge of peculation, and had to refund 1,000,000 francs into the public treasury. He now decidedly joined the party which sought the overthrow of the emperor and the restoration of the Bourbons. After the return of the Bourbons in 1815, he sat for several years in the Chamber of Representatives, where he figured as an opponent of Liberalism. He was also for a short time minister of state. The revolution of 1830 and the loss of his fortune (occasioned by extravagance) caused his reason to give way, and he died in a lunatic asylum at Caen in 1834. His venomous memoirs on Napoleon, the Directory, the Consulate, the Empire, and the Restoration (10 vols. 1829; new ed. 1899-1900) are maintained by Augustin Thierry to be almost entirely the work of Villemarest (*Les Grandes Mystifications*, 1911).

Bourse. See EXCHANGE.

Boussa, or BUSSONG, familiar by name in Europe as the scene of Mungo Park's death in 1803, is a town (pop. 13,000) on an island in the Niger, in the north-western part of Nigeria. It is not commercially important.

Boussingault, JEAN BAPTISTE, a French agricultural chemist, was born at Paris in 1802, and after a visit to South America, where he served as a colonel under Bolivar, became professor of Chemistry at Lyons, in 1839 was admitted into the Institute, and in 1857 was made commander of the Legion of Honour. His *Economie Rurale* (1844; Eng. trans. 1845) embodies the investigations which made him famous. Of four or five other works the most important is *Agronomie, Chimie agricole, et Physiologie* (7 vols. 1860-84). He died 12th May 1887.

Boustrophe'don. See ALPHABET.

Bouterwek, FRIEDRICH (1766-1828), born at Oker, near Goslar, held a chair of Philosophy at Göttingen, and, at first a Kantian, attached himself to the system of Jacobi. He wrote a famous history of modern European poetry and eloquence.

Boutroux, ÉMILE (1845-1921), author of *De la Contingence des Lois de la Nature* (1879), was born at Montrouge. He wrote much on ethical questions, on the history of philosophy, on science and religion, on Leibniz, on Pascal, on William James. He became a professor in the university of Paris in 1888, a member of the Institute in 1898, of the Academy in 1912, and delivered the Gifford Lectures at Glasgow in 1908.

Bouts-rimés (Fr., 'rhymed endings') are a kind of verse, the making of which forms a social amusement. Some one of the party gives out the rhymes or endings of a stanza, and the others have to fill up the lines as they best may. Suppose the rhymes prescribed are *wave, lie; brave, die*; the following are two of the ways in which the lines might be completed:

Dark are the secrets of the gulfin	wave,
Where, wrapped in death, so many heroes	lie;
Yet glorious death's the guerdon of the	brave;
And those who bravely live can bravely	die.
Whenever I sail on the	wave,
O'ercome with sea-sickness I	lie;
I can sing of the sea, and look	brave;
When I feel it, I feel like to	die.

These were once very popular, especially in France, and endless ingenuity was wasted on 'this foolish kind of wit.' See No. 60 of the *Spectator*.

Boutwell, GEORGE SEWALL, an American statesman, born at Brookline, Massachusetts, 28th January 1818, was a member of the state legislature (1842-51), and governor of Massachusetts (1851 and 1852). Having joined the Republican party, in 1862 he organised the new department of internal revenue, and sat in congress from 1862 to 1869.

taking a leading part in the impeachment of President Johnson (1868). He was secretary of the treasury, 1869-73, and for two years after represented Massachusetts in the senate. Besides speeches, he published *Educational Topics and Institutions* (1858), and works on United States Taxes (1863 and 1865). He died in 1905.

Bouvardia, a Mexican genus of Rubiaceæ, sub-order Cinchonaceæ. *Bouvardia triphylla*, with oblong ternate leaves and beautiful corymbs of scarlet flowers produced from June to November, has obtained a place among the favourite ornaments of flower-borders in Britain, but requires careful protection from frost. To preserve it, the roots are generally taken up.

Bouvines, a village in the French department of Nord, 8 miles S.E. of Lille, the scene of the victory of Philip Augustus of France over the Emperor Otto IV. in 1214—commemorated by a monument (1863)—and of a series of struggles in 1794 between the Austrians under Kinsky and the victorious French army of the north.

Bovate (Lat. *bos*, 'ox') or OXGANG, an old English land-measure; as much as an ox can plough in a season—an area varying according to circumstances from 8 to 18, or sometimes even 24 acres. It was the eighth of a *carucate*.

Bovey Coal is a form of wood-coal or lignite, which derives its name from being found at Bovey, in Devonshire.

Bovidae, a family of even-toed, hollow-horned, ruminant, hoofed mammals (*Artiodactyla ruminantia*, *Cavicornia*). The sheep and antelope types form the other division of the same series. The Bovidae include the various varieties of ox (*Bos*), the buffalo (*Bubalus*), the Tibet ox (*Poephagus*), the bison, and perhaps also the more widely separated musk-ox (*Ovibos*). The limits or relative value of the different genera are somewhat doubtful, but there is no doubt that the distinctions between *Bos* and *Ovibos* are greater than those between *Bos* and any of the other genera or sub-genera. The term is sometimes used as equivalent to hollow-horned ruminants, but is here used (as equivalent to Bovinæ) to include those that remain after subtracting the sheep and antelope types (*Ovina* and *Antelopina*). The large compact hairy body, the short strong legs, the usually smooth and round curved horns, the broad snout and naked nostrils, the undivided upper lip, the absence of tear-pits and hoof-glands, the frequent dewlap, the four teats, and the more general characters of the replacement of upper front teeth by a fibrous elastic pad, of characteristic canon-bones (fused metacarpals and metatarsals), of complex stomach and cud-chewing ruminant habit, are familiar to most. In their wild state they are gregarious nomadic animals, swift of foot, eating hurriedly, masticating and digesting at leisure. They feed on grass and herbage, which seem to be collected by the tongue, held by the lower teeth, upper lip, and fibrous pad, and half bitten, half torn away by a quick movement. The hollow horns, occurring on both sexes, are formed from the skin, and simply based on a process of the forehead (frontal) bone; they obviously serve as weapons both against foes and rival fellows. The ancient and ancestral *Bos primigenius*, the numerous wild species such as Banteng and Gaur, the abundant varieties of domesticated cattle, the Asiatic Buffalo (*Bubalus bubalis*), the giant Arni (*Bubalus arni*), the wild and also domesticated Tibetan Yak (*Poephagus grunniens*), the ancient and still extant European Bison (*B. europæus*), the American Buffalo or Bison (*B. americanus*), are important forms in no way widely separated from the *Bos* type. But in

the Musk Ox (*Ovibos moschatus*) the very small naked portion of the snout and the short hair-covered tail are marked, though hardly important, differences. It is often included among the sheep and goats (*Ovina*). Altogether there are about thirteen modern species, widely distributed in Europe, Asia, Africa, and North America. Numerous fossil forms are known from the Pliocene upwards. The utility of these forms to man, both in their wild and in their domesticated states, is too well known to require statement. The flesh, the fat, the milk, the hair, the skin, the viscera, bones, horns, dung, &c. are in common use, and the animals themselves have in many cases become beasts of burden. See CATTLE, and other separate articles.

Bovino, a cathedral city of South Italy, 20 miles SSW. of the town of Foggia. Pop. 8000. The Imperialists defeated the Spaniards here in 1734.

Bow of a ship is the general name for the stem and fore-part, or that which cuts the water. The word is often used in the plural, the ship being considered to have starboard and port bows, meeting at the stem. Starboard is applied to the right-hand side, and port to the left-hand side, looking forward. A fine or lean bow, and a full or broad bow, are seamen's phrases for different types; and the 'V form,' or 'U form,' is a nomenclature adopted by the naval architect to denote the character of a section of the bow. See SHIPBUILDING.

Bow and Arrow. See ARCHERY.

Bowdich, THOMAS EDWARD, African traveller, was born at Bristol 20th June 1791, for a year was a hatter in his native city, but in 1814 received a writership in the service of the African Company. Selected in 1816 to conduct a mission to the king of Ashanti, he succeeded in his difficult negotiation, and thus paved the way for commerce and the exploration of the interior. On his return to Europe (1818) he resided for some time in Paris, where he studied mathematics and other subjects to such purpose as to gain a valuable Cambridge prize. Aggrieved at his treatment by the African Company, he exposed their management in a volume which led the government to take over their possessions. In 1822 he sailed for Africa, and began a trigonometrical survey of the Gambia, where he died of fever, 16th January 1824. See his *Mission from Cape Coast Castle to Ashanti* (1819), and the narrative of his last voyage, edited by his wife (1825).

Bowditch, NATHANIEL, an American mathematician and astronomer, born 26th March 1773, at Salem, Massachusetts. He showed at a very early age a great inclination for mathematics, in which he afterwards made great proficiency without ever attending a university. He was at first bred to his father's trade of a cooper, and afterwards apprenticed to a ship-chandler. He acquired Latin that he might study Newton's *Principia*, and at a later period studied French, Spanish, Italian, and German. He particularly devoted himself to the study of the practical applications of science. Between 1795 and 1803 he acted in turn as clerk, supercargo, and master of a merchant-ship in five long voyages, and added a thorough practical acquaintance with navigation to a theoretical knowledge of it. His *New American Practical Navigator* (1802) was received with great favour. He published also an admirable translation of Laplace's *Mécanique Céleste* (1829-38), to which he added valuable annotations, and upon this achievement his fame chiefly rests. These works obtained for him marks of honour from scientific societies in Europe, and led to offers, which he declined, of the professorship of Mathematics and Astronomy in Harvard College (1808), the university of Virginia (1818), and

West Point (1820). In 1823 he became actuary of the Massachusetts Life Insurance Company, and was afterwards president of the Academy of Arts and Sciences in Boston, and a member of the corporation of Harvard College, from which he received the degree of LL.D. He died at Boston, 16th March 1838. See *Memoir* by his son (1839).

Bowdler, THOMAS, who has immortalised himself unhappily as the editor of the 'Family Shakespeare,' was born of wealthy parents at Ashley, near Bath, July 11, 1754. At sixteen, he went to St Andrews to study medicine, but graduated M.D. of Edinburgh in 1776, and after some years of travel, settled in London, devoting himself mainly to charitable work. He lived for ten years at St Boniface, Isle of Wight, and for the last fifteen years of his life at Rhyddings, near Swansea, where he died February 24, 1825. In 1818 Bowdler published 'The Family Shakespeare, in 10 vols.; in which nothing is added to the original text; but those words and expressions are omitted which cannot with propriety be read aloud in a family.' The work was long popular, and Swinburne praised the achievement, though 'bowdlerising' has become a synonym for superfluous expurgation. Ludovicus Vives had expurgated the classics, and Garrick 'bowdlerised' Shakespeare before Bowdler, who also prepared a purified edition of Gibbon's History (6 vols. 1826) under the title 'Gibbon's History of the Decline and Fall of the Roman Empire, for the use of Families and Young Persons, reprinted from the original text, with the careful omissions of all passages of an irreligious or immoral tendency.' In a note, the editor says that 'it was the peculiar happiness of the writer' to have so purged Shakespeare and Gibbon that they could no longer 'raise a blush on the cheek of modest innocence, nor plant a pang in the heart of the devout Christian.'

Bowdoin, JAMES, an American statesman, of Huguenot descent, born in Boston in 1727, graduated at Harvard in 1745, was elected to the Continental Congress in 1774, but was unable to attend, and in 1785-86 was governor of Massachusetts. He published scientific papers, poems, &c.; referred, in a letter to Benjamin Franklin, the phosphorescence of the sea to animalcules; was F.R.S., LL.D.; and in his honour Bowdoin College, at Brunswick (q.v.) in Maine, was named. He died in 1790.

Bowels. See ABDOMEN, COLIC, CONSTIPATION, DIARRHŒA, DIGESTION, DYSENTERY, ENTERITIS, HERNIA, INTUS-SUSCEPTION, PERITONITIS, TAPEWORMS, &c.

Bowenite, a hard variety of serpentine, which has been confused with jade, and used in like manner.

Bower, or BOWMAKER, WALTER, frequently spoken of as 'the continuator of Fordun,' completed the history of Scotland which is known as the *Scotichronicon*, and which was begun by Fordun. Not much is known of Bower's personal history. We know from his own statement that he was born in 1385; and in the British Museum MS. of the *Scotichronicon*—which MS. is known as *The Black Book of Paisley*—he is spoken of as 'the venerable father in Christ, Walter Bower, Abbot of the Monastery of St Columba.' This monastery was situated on the island of Inchcolm in the Firth of Forth. He died in 1449. Bower has been too much overlooked as one of the authors of the *Scotichronicon*, which is frequently quoted as if Fordun wrote the whole of it, whereas his share of the work, with the exception of certain further materials which he had collected, ends at the close of Book V. with the death of David I. (1153). Bower continued the history to the death of James I. (1437),

and as he was contemporary with the later events which he describes, he is for this period entitled to be regarded as an independent historian. Like Fordun, he wrote in Latin. The only edition of his history is that printed by Walter Goodall, Edinburgh, in 1759, and no complete translation of it has yet appeared.

Bowerbankia, a common genus in the class of Bryozoa or Polyzoa. These are colonies of minute but highly organised animals, which used to be included among the hydroids or zoophytes, but are now unanimously placed at a much higher level. *B. imbricata* is one of the commonest British coast forms. It grows on seaweeds, corallines, stones, &c., between high and low water mark, or in no great depth of water, and forms branching tufts sometimes $1\frac{1}{2}$ inch in height. The branches are smooth and transparent, and bear numerous individual animals of microscopic size. The genus is named after James Scott Bowerbank (1797-1877), who wrote a famous monograph on the British Spongiadae (1864). See POLYZOA.

Bower-bird, a name given to certain Australian birds, probably in the great family of Timeliinae, or babbling thrushes, remarkable for their habit of making bower-like erections, called runs by the colonists of New South Wales, and for adorning them with gay feathers, rags, bones,



The Spotted Bower-bird (from Brehm).

shells, and such other white or brightly coloured objects as they can pick up. These bowers are not used as nests, but they appear to be places of much resort at the breeding-season in particular. Their structure has been carefully examined, and fine specimens of them, transported with no little difficulty, were deposited in the British Museum by Gould, in whose magnificent work on the *Birds of Australia* (1848) a full account of them was first given to the world. The bowers of the Satin Bower-bird (*Ptilonorhynchus holosericeus*) are built among the low branches of some tree, and appear to be repaired and frequented from year to year. The base consists of an extensive and rather convex platform of sticks, firmly interwoven, on the centre of which the bower itself is built of more flexible twigs. It is chiefly at and near the entrance that the shells, feathers, &c. employed for decoration are placed. The bowers of the Spotted Bower-bird (*Chlamydo-dera maculata*) are longer and more avenue-like than those of the satin bower-bird; they are placed upon the ground, are outwardly built of twigs, and beautifully lined with tall grasses so disposed that their heads nearly meet. The decorative propensity appears in the highest degree in this species. 'In some of the larger

bowers, which had evidently been resorted to for many years,' Gould says, 'I have seen nearly half a bushel of bones, shells, &c. at each of the entrances.' These are arranged in much the same way at both entrances. Small pebbles are often transported by the birds from considerable distances.

The satin bower-bird is particularly abundant in the mountainous districts of the west of New South Wales, and is found in all the 'brushes' from the mountains to the coast. The adult male has the whole plumage of a deep, shining black. The colours of the female are grayish green and brown, curiously mingled.—The Spotted Bower-bird, which is rather smaller than the satin bower-bird, or about the size of a starling, has a general colour of rich brown, beautifully marked with black and buff; a band of elongated feathers of light rose-pink crosses the back of the neck, and forms a broad, fan-like, occipital crest. It is restricted exclusively to the interior of Australia.—The Regent-bird (*Sericulus melinus*) has also been shown to form bowers. Mr Coxen, an Australian ornithologist, to whom many interesting observations on bower-birds are due, has described the love-tent of the regent-bird. It is less dome-shaped and smaller than that of the satin bower-bird, and appears to be wholly adorned with snail-shells. The use of such elaborate contrivances in the process of courtship, and the possession of such obvious æsthetic tastes, are circumstances of great interest in estimating the height of development reached by birds.

Bowie-knife, an American hunting dagger, named after its inventor, Colonel Jim Bowie, who, born about 1790, fell at Fort Alamo in the Texan war (1836). In a great mêlée near Natchez (1827), in which six men were killed and fifteen wounded, the colonel despatched an opponent with a knife made out of a blacksmith's rasp or big file; and this knife he afterwards had fashioned at Philadelphia into the weapon with which his name is associated. Its curved, double-edged blade is 10 to 15 inches long, and above an inch wide.

Bowles, CAROLINE. See SOUTHEY.

Bowles, WILLIAM LISLE, D.D., poet, was born 24th September 1762, at King's Sutton, in Northamptonshire, where his father was vicar. Educated at Winchester School and at Trinity College, Oxford, in 1804 he became a prebendary of Salisbury Cathedral and rector of Bremhill, in Wiltshire. Here he spent in easy circumstances the rest of his long life, dying at Salisbury, 7th April 1850. His earliest publication, *Fourteen Sonnets, written chiefly on Picturesque Spots during a Journey* (1789), was received with extraordinary favour; the contents of the little volume were fresh and natural, all the more charming because of the contrast they offered to the style of poetry which had long been in vogue. Coleridge, Wordsworth, and Southey were among their enthusiastic admirers; and through his influence over them, Bowles may be looked on as the founder of a school of English poetry in which his own name was soon eclipsed by theirs. Of his subsequent poetical works (14 vols. 1789-1837) the longest is *The Spirit of Discovery*, and the best, perhaps, *The Missionary*. As a poet Bowles shows a fine appreciation of the beauties of nature, and pleases by the expression of pure and generous sentiment, as well as by the playfulness of fancy and perfect scholarly correctness; but he is deficient in vigour and depth. In 1807 he published an edition of Pope, and an opinion which he expressed on Pope's poetical merits led to a rather memorable controversy (1809-25) in which Campbell and Byron were his antagonists, and which turned chiefly upon the comparative

value in poetry of images derived from nature and those derived from art. Of his prose writings may be mentioned a rather dry *Life of Bishop Ken* (2 vols. 1830). See the Memoir by Gilfillan prefixed to his collected poems (Edin. 1855).

Bowling, a Dumbartonshire village, on the Clyde, 3½ miles ESE. of Dumbarton.

Bowling Green, a city of Kentucky, capital of Warren county, on the Barren River, 114 miles S. by W. of Louisville by rail; pop. 10,000.—There is another city of the same name, capital of Wood county, Ohio; pop. 6000.

Bowls, or BOWLING, is an English pastime of undoubted antiquity. Strutt in his *Sports and Pastimes* reproduces a picture of two men playing a game with bowls from a MS. of the 13th century (Royal Library), and another from a MS. of the 14th century, representing three men bowling at a 'jack,' very much as the game is now practised, except that the players have only one bowl apiece.

It seems to be a doubtful point whether the ancient game was played in the open air or in closed alleys, or both; or whether, perhaps, there may not have always been two varieties of the game, one the outdoor game as we now know it, and an undercover game of bowling at pins. There is no doubt that, in the 15th and 16th centuries, *bowling-alleys* were not only very numerous, especially in the city and suburbs of London, but also became public nuisances on account of the gambling and dissipation carried on in connection with them. In the reign of Edward IV. a stringent act was passed forbidding any one to play at, among other games, *half-bowl*, either in 'house, tenement, garden, or other place,' on account of players being induced to play 'till they be utterly undone and impoverished of their goods.' This game of half-bowl is described by Strutt as still being played in Hertfordshire in his day (1801); fifteen small pins were bowled at with half of a sphere of wood, hence the name.

The name *bowls* first occurs in several acts passed by Henry VIII., who prohibited any person or persons, 'for his or their gain, lucre, or living, to keep, have, hold, occupy, exercise, or maintain any common house, alley, or place of bowling.' In spite of these acts, however, the game continued to exist, as it was not till the reign of George II. that the gambling *alley* game, against which the denunciations of the law seem to have been directed, became, more or less, actually suppressed. From about the same time, however, the outdoor game spread with such rapidity, that before the close of the century it was almost universal all over England and Scotland.

Bowling as now played is a delightful summer-evening game, and affords pleasant recreation to thousands who are past the age at which the more violent exertions of cricket or football have charms. Every village has its club and 'green,' and larger towns have them in every district. Its great drawback as a popular game is the expense of preparing the necessary smooth, fine turf-green, this being, according to circumstances, from £100 to £300, or even more. So much, however, is it acknowledged to be a healthful and innocent recreation, that the civic authorities of many towns have prepared public greens, where, for a small charge, players may enjoy the game who are not able to indulge in the luxury of private ground.

The game itself is a very simple one. The requirements are a piece of fine *level* turf 40 to 60 yards square, surrounded by a shallow ditch, a pair of bowls for each player, and a small white ball or 'jack.' The green is usually sunk below the level of the surrounding ground. The bowls are

made of lignum-vitæ, 6 to 7 inches in diameter, turned more or less oval, with one side a little rounder than the other. This gives a *bias* to the bowl, which rolls in a curved direction instead of straight.

The players are usually arranged into opposing sides of four each, although any number can play. The jack having been thrown by one of the players to a distance of not less than 20 yards from one end of the green, the object of the combatants is to roll their bowls so as to lie as near the jack as possible. The bias gives scope for considerable skill in playing the bowl, as it may be made to curve in, either from the right or from the left, as may seem best in order to dodge round other bowls which may be in the way. When all the sixteen bowls have been played, a point is counted for every bowl belonging to one side which is nearer the jack than the nearest bowl of the other side. The jack is then thrown by the winning side to the other end of the green, another 'end' played as before, and so on till one side or the other becomes game; which may be any number mutually agreed on—usually 21 or 31. The game may also consist of so many ends to be played, the side counting most at the conclusion to be the winner. Each side appoints one of their number 'skip,' who has full authority to direct the play of the others of his side. The game is identical in principle with 'Curling' (q.v.), with the difference, that the distance is always fixed in the latter, while in bowling it is uncertain. There are regularly appointed rules for playing the game, providing for such points as the jack being moved by a bowl, or being thrown into the ditch, and many other details which are beyond our province.

Bowling is also the name applied to a game of ten pins introduced from the United States. It is evidently either an improved variety of the English Skittles (q.v.), or a revival of a game called *long-bowling* or Dutch rubbers, which was played in England about the middle of the 18th century, and was exactly like the American game, except that nine pins were used. This game of long-bowls again was obviously either a development of the ancient half-bowl or similar game of bowls and pins, or a bodily introduction of the Dutch game of ninepins as played by 'Rip Van Winkle.' The game is becoming common in this country, where, in the suburbs of almost every large town, the 'American Bowling Alley' is a popular resort of the youth of the district. It is played in a covered alley on a prepared board 60 feet long by 4 feet wide. In America the board is slightly convex in the centre, and bevelled to the sides. The ten pins, usually of ash, and about 1 foot high,



are arranged as in the figure. Each player in turn rolls three bowls from the other end of the board, trying to knock over as many pins as possible. If he knocks all the ten down before he exhausts his three throws, he is entitled to get them set up again to complete his turn. He may even knock all the pins down with each of his three bowls, in which case he scores the maximum for his turn, 30, being one for each pin down. The other players then have their turn. A game consists of three or more such turns of three bowls for each player; he who knocks over most pins being the winner. The bowls are usually made of lignum-vitæ, are round, and of unlimited size, generally varying from $\frac{1}{2}$ a lb. to 5 or 6 lb. in weight. Such is the principle of the game, but in practice a complicated method of scoring exists. When a player knocks all the pins down with one or two bowls, he has what

is called a 'spare' or a 'double spare'—i.e. he has one shot or two shots, as the case may be, to spare. To save time he does not get the pins put up again immediately, but waits for his next turn, when, in the case of a 'spare,' his first shot, and of a 'double,' his first two shots are counted double—viz. once for the spares of the turn before, and once for the current turn. He may even have another double or single spare, when the scoring is carried over into the third turn, and so on. In the last turn of the game, however, the spares must be played off at once. This game is undoubtedly good exercise, but it has the drawback of not being played in the open air, and it is also too often associated with the public-house. See Manson, *The Complete Bowler* (1912). For bowling in cricket, see CRICKET.

Bowman, SIR WILLIAM, oculist, was born in Nantwich, 20th July 1816, studied chiefly in London, where he commenced practice as a surgeon, and became curator of the Anatomical Museum. In conjunction with Todd he published the *Anatomy and Physiology of Man* (5 vols. 1845–56), and gained reputation as an oculist by his *Lectures on Operations on the Eye* (1849). He was professor of Physiology at King's College, London (1845–55), F.R.S., LL.D., and a baronet (1884). He died 29th March 1892, and his *Collected Papers* (2 vols.) were published the same year.

Bowness, a town of Westmorland, on the east side of Windermere, 8 miles NW. of Kendal, since 1905 part of Windermere urban district.

Bowring, SIR JOHN, born in Exeter in 1792, on leaving school entered a merchant's office, and there pursued that course of polyglot study whereby, as he afterwards boasted, he knew two hundred, and could speak a hundred, languages. The national poetry of different peoples had special attractions for him, and he rendered great service to literature by translating both the more ancient and the more modern popular poems of almost all the countries of Europe. In 1821 he formed a close friendship with Jeremy Bentham, and in 1824 became the first editor of his radical *Westminster Review*, to which, as bequeathed the descendant of an old Puritan stock, he contributed many articles on freedom in religion and politics, as well as on literary subjects. In 1828 he visited Holland; and his *Sketch of the Language and Literature of Holland* (1829) procured for him the degree of Doctor of Laws from the university of Groningen. Subsequent travels were undertaken by him, on a commission from the British government, to inquire into the commercial relations of certain states. He visited Switzerland, Italy, Egypt, Syria, and finally the countries of the German Zollverein, and everywhere found materials for valuable reports. He sat in parliament for Kilmarnock from 1835 to 1837, for Bolton from 1841 to 1849, and actively promoted the adoption of free trade. In 1849 he was appointed British consul at Hong-Kong, and superintendent of trade in China. He returned in 1853, and in the following year was knighted and made governor of Hong-Kong. In 1856, an insult having been offered to a Chinese pirate bearing the British flag (the 'affair of the *lorcha Arrow*'), Bowring, without consulting the home government, ordered the bombardment of Canton, a proceeding which excited grave dissatisfaction at home, and nearly upset the Palmerston ministry. In 1855 he concluded a commercial treaty with Siam, in 1858 made a tour through the Philippine Islands; and his accounts of those two visits are about the most readable of his thirty-six works. He retired with a pension in 1859, and died at Claremont, Exeter, 23d November 1872. See his *Autobiographical Reminiscences* (1877).

Bowspnit is a strong boom or spar projecting over the stemhead or bows of a sailing-ship, and also of a steamship when the stem of the latter is of the curved or cut-water description. Its use is to support the jib-boom, a longer and lighter spar, forming a continuation of the bowspnit, which receives the lower ends of the foremast stay-ropes, on which sails are carried.

Bowstring, the string of a bow, is a name specifically used for an old Turkish mode of execution, the offender being strangled by means of a bowstring.

Bowstring Hemp, or **MOORVA**, is the fibre of a species of *Sansevieria* (especially *S. Zeylanica*), a plant of the natural order Liliaceæ (q.v.), tribe Hemerocallææ, used for making bowstrings in the East Indies. The fibre is hair-like and silky, elastic, and in strength apparently about equal to hemp. It does not rot in water so soon as hemp.—A very similar species (*S. guineensis*) is found in abundance on the west coast of Africa, and its fibre has been imported as African Bowstring Hemp.

Bow-window. See BAY-WINDOW.

Bowyer, SIR GEORGE, born in 1811 at Radley, near Oxford, in 1839 was called to the bar. Converted to Catholicism in 1850, he represented Dundalk 1852-68, and the county of Wexford 1874-80, when his Home Rule principles estranged him from the Liberal party, and in 1876 led to his expulsion from the Reform Club. He succeeded his father as seventh baronet in 1860, and died suddenly in London, 7th June 1883. He was author of several able works on constitutional law and Catholic subjects.

Bowyer, WILLIAM, an eminent English printer and classical scholar, born in London, 19th December 1699, was educated at Cambridge, and in 1722 joined his father, William Bowyer (1663-1737), in trade. Appointed in 1729 printer of the votes of the House of Commons, he subsequently became printer to the Society of Antiquaries and to the Royal Society. In 1767 he was nominated printer of the Rolls of the House of Lords and the Journals of the House of Commons. He died 18th November 1777. Bowyer published several philological tracts, edited several volumes of Swift's works, translated Rousseau's famous but paradoxical *Discourse* (1751), and wrote two essays on the *Origin of Printing* (1774); but his chief production was an edition of the New Testament in Greek with critical and emendatory notes.

Box (*Buxus*), a genus of Buxaceæ or (Bentham and Hooker) Euphorbiaceæ, evergreen shrubs or small trees, with greenish inconspicuous monœcious flowers in little axillary spikes or fascicles. The Common Box (*B. sempervirens*) grows wild through South Europe, North Africa, North Asia to Japan, West Asia to West Himalaya. It is generally regarded as a true native of Surrey and the south of England, where it grows on dry chalky hills. In Britain, it seldom attains a height of more than 12 or 14 feet, though in warmer countries it is often twice that height, and though the three classic box-trees in Queen Mary's 'child-garden' at Inchmahome, in the Lake of Menteith, are 20½ feet high. The box is remarkable for its compact habit of growth and densely crowded branches and leaves, presenting a very solid mass of foliage, hence it bears clipping remarkably well; and in the old 'topiary' style of ornamental gardening it occupied an important place, being cut into architectural and fantastic figures. A dwarf variety is used for edging garden-plots, and different kinds are grown in our shrubberies. The bitter and purgative leaves are no longer official. The wood of the box is heavier than that of any other European

tree, and is the only European wood that sinks in water. It is of a beautiful pale-yellow colour, remarkably hard and strong, of a fine regular and compact texture, capable of a beautiful polish,



Branch of the Common Box (*Buxus sempervirens*).

and not liable to be worm-eaten. It is much valued for the purposes of the turner and the wood-carver; is preferred to every other kind of wood for the manufacture of flutes, flageolets, and other wind-instruments, as well as of mathematical instruments; and is unrivalled for wood-engraving, admitting of a finish as sharp and fine as metal, whilst it takes the ink much better (see ENGRAVING). The box of commerce comes mainly from Caucasus, Asia Minor, and Persia; but reckless destruction has made it scarce and dear. In 1815 as many box-trees were cut down at Box Hill, in Surrey, as brought upwards of £10,000; but the tree is of so very slow growth that it is seldom planted in Britain except for ornament.—The Minorca Box, or Balearic Box (*B. balearica*), a native of the Mediterranean countries, &c., is a larger tree than the common box. The wood is of a bright yellow, and inferior to the true boxwood, but is brought in large quantities from Constantinople under that name. The South African Box (*B. Macowanii*) is very suitable for engraving.

Box-days. These are days appointed by the Court of Session in Scotland, in the vacations and Christmas recess, on which pleadings or other law-papers may be lodged or filed, the object being to expedite the procedure, notwithstanding the vacation or recess. The name is derived from the fact that all printed papers in the Court of Session must be placed in boxes, one for each judge, for each legal society, and for the reporters. These boxes were introduced in 1690 to avoid the evil of private solicitation of judges.

Boxers, a Chinese secret society ('The Fist of Righteous Harmony'), whose movement against foreigners and foreign influences culminated in the siege of the legations in Peking, and their relief by an international force in 1900. See CHINA.

Box-hauling is a mode of turning a ship when the swell of the sea renders tacking impossible, or when the ship is too near the shore to allow room for veering. The operation is effected by hauling the head-sheets to windward, bracing the head-yards aback, and squaring the after-yards, the helm at the same time being put alee. *Boxing-off* is a very similar operation.

Boxing. See PUGILISM.

Boxing-day, the day after Christmas (q.v.), so called in England from being the day on which *Christmas-boxes*, or presents, are given.

Boxtel, a town in the Dutch province of North Brabant, 38 miles S. by E. of Utrecht. An Anglo-Dutch army, under the Duke of York, was here

defeated with great loss by the French in 1794. Pop. 8000.

Box-thorn (*Lycium*), a genus of Solanaceæ, having funnel-shaped or tubular flowers, and two-celled berries. Several species are natives of the south of Europe, thorny shrubs, with long slender shoots and simple lanceolate leaves. *L. europæum* may be trained to a height of 30 or 40 feet, and is often planted—as are also other species—to cover walls, &c. *L. vulgare* has been sparingly naturalised in the United States. *L. fuchsoides*, although destitute of spines, is used as a hedge-plant in the Andes of Quito.

Boyacá, a town of Colombia, in the Cordillera Oriental; pop. 7000. At Boyacá, Bolívar by a decisive victory over the Spanish army, 7th August 1819, secured the independence of New Granada.

Boyar, an order in old Russia, next to the knjazes or knjeses (ruling princes). They had their own partisans, and gave their services to a prince of their own choice, whom they left again at their pleasure. They held the highest military and civil offices, and were so universally looked up to by the mass of the people, that the most powerful rulers considered it prudent to use this form in their ukases: 'The emperor has ordered it; the Boyars have approved it.' Their rank was always proportioned to length of state-service. In their housekeeping the Boyars were excessively fond of splendour, and their contempt for the serfs or 'lower orders' was immeasurable. Their power acted as a wholesome check upon the authority of the princes, in consequence of which the latter became their bitter enemies. Peter the Great finally abolished the order by giving them a place among the Russian nobility, but at the same time stripping them of their peculiar privileges.—The higher nobility of Rumania are also called Boyars.

Boyaux (Fr., 'bowels') are the zigzag approaches used in siege operations to connect the parallels. See SIEGE.

Boy-bishop. The custom of electing a boy-bishop on St Nicholas's Day dates from a very early period. It spread over most Catholic countries, and in England seems to have prevailed in almost every parish. Although the election took place on St Nicholas's Day (6th December), the authority lasted to Holy Innocents' Day (28th December). The boy-bishop was chosen from the children of the church or cathedral choir, or from the pupils at the grammar-school. He was arrayed in episcopal vestments, and, attended by a crowd of subordinates in priestly dress, went about with songs and dances from house to house, blessing the people, who, as Bishop Hall says, 'stood grinning in the way to expect that ridiculous benediction.' The mock prelate exacted implicit obedience from his fellows, who, along with their superior, took possession of the church, and performed all the ceremonies and offices except mass. The custom found countenance not among the populace only. In 1299 Edward I., on his way to Scotland, permitted a boy-bishop to say vespers before him at Heaton, near Newcastle-on-Tyne. At Salisbury the boy-bishop, it is said, had the power of disposing of such prebends as happened to fall vacant during the days of his episcopacy; and if he died during his office, the funeral honours of a bishop, with a monument, were granted him. The genuineness of 'the boy-bishop's monument' in Salisbury Cathedral has, however, been seriously questioned. In England the custom was abolished by a proclamation of Henry VIII., dated July 22, 1542; restored by Queen Mary in 1554; and again abolished in Elizabeth's time, though it seems to have lingered here and there in villages till about

the close of her reign, and was revived in the 20th century. It was interdicted at the Council of Basel (1431); and at Zug a similar usage was suppressed in 1797. See Leach, *Schools of Mediæval England* (1915); Chambers, *Mediæval Stage* (i. 1915).

Boyce, WILLIAM, composer, born in London, 1710, was a chorister at St Paul's, and was appointed composer to the Chapel-royal in 1736, and organist in 1758. He received the degree of Doctor of Music from Cambridge in 1749, and was master of the king's band from 1755. He died at Kensington, 7th February 1779. Boyce holds a high rank as a composer of church music, his two services and several of his anthems being still frequently performed. His songs include 'Heart of Oak,' written for one of Garrick's pantomimes; and a miscellaneous collection of his songs and cantatas extended to 6 volumes. His best work is the serenata of *Solomon* (1743); his most valuable publication is a collection of the *Cathedral Music* of the two preceding centuries (3 vols. 1760).

Boycotting, the system of combining to hold no relations, social or commercial, with a neighbour, in order to punish him for differences in political opinion—a kind of social excommunication. It was first formulated by Mr Parnell, the Irish leader, at Ennis on 19th September 1880, and derived its name from one of the first victims, Captain Boycott, a Mayo factor and farmer, who has had for his sufferings the consolation of giving a new word to most European languages. The term 'exclusive dealing' has been applied by its apologists to boycotting, which was brought within the law by the Crimes Act of 1887.

Boyd, REV. ANDREW KENNEDY HUTCHISON, D.D., son of the parish minister of Auchinleck, Ayrshire, where he was born November 1825, was educated at King's College, London, and Glasgow University, where he took the highest honours in philosophy and theology. He was in succession minister in three Scottish parishes before his settlement at St Andrews. He first became known in literature by his familiar essays contributed to *Fraser's Magazine* under the now well-known initials A. K. H. B., most of which have been reprinted—some of these, in three series of them as *The Recreations of a Country Parson* (1859-61). Three volumes of reminiscences—*Twenty-five Years of St Andrews* (2 vols. 1892) and *St Andrews and Elsewhere* (1895)—were his last considerable work. He died 1st March 1899.

Boyd, ZACHARY, born in Ayrshire about 1585, and educated at Glasgow and St Andrews, became a professor in the college of Saumur (q.v.). The persecution of the Huguenots having caused him to return to Scotland in 1621, he was two years later appointed minister of the Barony parish, Glasgow, and was thrice elected rector of the university. His *Last Battell of the Soule in Death* (in prose, 1629) was reprinted in 1831; of the quaint *Zion's Flowers* (1644)—mostly metrical versions of Scripture history—a selection was reprinted in 1855. He died in 1653 or 1654.

Boydell, JOHN, was born at Dorrington, Shropshire, in 1719, and having learned engraving, about 1750 started a print-shop in London, and liberally patronised native engravers. For a splendid edition of Shakespeare (9 vols. folio, 1792-1801) he secured the assistance of painters like Opie, Reynolds, Northcote, and West, and from this 'Shakespeare Gallery' produced a superb volume of plates (1803). But his outlays involved him in serious financial embarrassment. He died 12th December 1840. In 1790 he had been Lord Mayor.

Boyer, ALEXIS, BARON DE (1757-1833), a great French surgeon, was born a tailor's son at Uzerches in Limousin, and in 1805 was appointed first surgeon

to Napoleon, whom he accompanied on his campaigns. After the Restoration he was professor of Surgery at Paris, and surgeon at the Charité.

Boyer, JEAN PIERRE (1776-1850), a mulatto, born at Port-au-Prince, did much to secure the independence of Hayti (q.v.), and became president of the black republic in 1818. He governed the state admirably for fifteen years; but power corrupted him, and he became partial and arbitrary. His partiality to the mulattoes made the pure negroes rise in insurrection in 1843; and Boyer fled to Paris, where he died.

Boyle, a town in County Roscommon, Ireland, on the river Boyle, above its expansion into Lough Key, 108 miles NW. of Dublin; pop. 2700.

Boyle, CHARLES (1677-1731), fourth Earl of Orrery, in 1721 was imprisoned in the Tower as a Jacobite. In the great controversy on the *Letters of Phalaris*, he was Atterbury's stalking-horse against Bentley (q.v.); and the Orrery (q.v.) was named in his honour by its inventor, Graham.

Boyle, JOHN (1707-62), fifth Earl of Orrery (1731), and fifth Earl of Cork (1753), is remembered more by his rancorous *Remarks on Swift* (1751), his intimate friend, as was also Pope, than by an excellent translation of the *Letters of Pliny* (1751).

Boyle, RICHARD (1566-1643), the Great Earl of Cork, was born at Canterbury, of good family. After studying at Cambridge and the Middle Temple, he went over to Ireland with a few pounds in his pocket to hew his way to fortune (1588). He married an heiress, purchased large estates in Munster and improved them, promoted the immigration of English Protestants, and won the favour of Queen Elizabeth. He built bridges, founded harbours and towns, erected thirteen strong castles, and from his ironworks reaped £100,000. About 4000 persons found employment on his vast plantations. He was knighted in 1603; in 1620 became Viscount Dungarven and Earl of Cork; and in 1631 was made lord high-treasurer, an office which remained hereditary in his family. In his old age the Munster rebels compelled him to turn his castle into a fortress, but he soon raised a little army, and quenched rebellion in his borders. See his *Life and Letters* by Dorothea Townshend (1904).

Boyle, ROBERT (1627-91), physicist, fourteenth child of the first Earl of Cork, was born at Lismore Castle in Munster, and after studying at Eton, and under the rector of Stalbridge, Dorset, went to the Continent for six years. On his return in 1644, he found himself in possession, by his father's death, of the manor of Stalbridge, where he devoted himself to chemistry and natural philosophy. He was one of the first members of the association (1645) which became the Royal Society. Settling at Oxford in 1654, he experimented in pneumatics, and improved the air-pump. As a director of the East India Company (for which he had procured the charter) he worked for the propagation of Christianity in the East, circulated at his own expense translations of the Scriptures, and by bequest founded the 'Boyle Lectures' in defence of Christianity against atheists, deists, pagans, Jews, and Mohammedans, but not taking account of the controversies of Christians amongst themselves. In 1668 he took up residence in London with his sister, Lady Ranelagh, and gave much of his time to the Royal Society. In 1688 he almost wholly withdrew from society in order to repair the loss caused by the accidental destruction of his MSS. He believed in the possibility of some of the alchemistic transmutations; but in virtue of his many pregnant observations and the multitude of hoary errors he exploded has justly been termed the true precursor of the modern chemist. He discovered 'Mariotte's

law' seven years before Mariotte (q.v.). He invented a compressed-air pump, and the first English hermetically sealed thermometer was made under his directions. His complete works (with his correspondence and a Life by Dr Birch) were published in 5 vols. fol. (1744). See *Life* by Flora Masson (1914). Among the Boyle lecturers have been Bentley, Samuel Clarke, F. D. Maurice, Plumtre, Stanley Leathes, and Wace.

Boyle, ROGER (1621-79), soldier and statesman, was third son of the Earl of Cork, and in childhood was made Baron Broghill. Educated at Trinity College, Dublin, he in the Civil War first took the royalist side, but after the death of the king came under the personal influence of Cromwell, and distinguished himself in the Irish campaign. He became one of Cromwell's special council and a member of his House of Lords. On Cromwell's death he tried to support Richard, but, foreseeing that his cause was hopeless, crossed to Ireland and secured it for the king. Four months after the Restoration he was made Earl of Orrery. He wrote poems, six tragedies, two comedies, a romance entitled *Parthenissa* (1654), and a *Treatise of the Art of War* (1677); and enjoyed the friendship of Davenant, Dryden, and Cowley.

Boyle's Fuming Liquor is a mixture of ammonium poly-sulphides obtained by distilling a mixture of slaked lime, sal-ammoniac, and sulphur; a straw-coloured liquid with the odour of rotten eggs, and liberating sulphuretted hydrogen on addition of an acid or exposure to the air.

Boyle's Law. See MARIOTTE.

Boylesse, RENÉ, an able French novelist and Academician (1918), born in 1867 at La Haye-Descartes (Indre-et-Loire), wrote *L'Enfant à la Balustrade* (1903) and other books.

Boyne, a river in the east of Ireland, rises in the Bog of Allen, and flows 80 miles to the Irish Sea 4 miles below Drogheda. At the battle of the Boyne, fought on its banks, 3 miles W. of Drogheda, on 11th July 1690 (1st July o.s.), but celebrated on the 12th, William III. with 40,000 men defeated James II. with an ill-equipped army of 26,000. William's Duke of Schomberg was shot dead. James fled from the field straight to France. The significance of the battle in deciding the fate of the Stewart cause was celebrated in a doggerel 'Boyne Water' song, the tune of which has continued, especially on the anniversary of the event, to inspire Orangemen and irritate militant Catholics. The version of the Orangeman's national hymn now sung begins, 'July the first, in Oldbridge town, There was a grievous battle,' but is not the oldest (see *Irish Minstrelsy* in 'The Canterbury Poets,' 1887).

Boyne City, a town of Michigan, at the SE. end of Pine Lake, 15 miles SSE. of Charlevoix, has lumbering and manufacturing industries; pop. 4000.

Boys' Brigades have all taken their rise from The Boys' Brigade, the pioneer organisation, which was founded in Glasgow in 1883 by Sir William A. Smith (1854-1914). The original company, now known as the 1st Glasgow Company, was formed in connection with the Mission Sunday School of the College Free Church, Glasgow, and consisted of 3 officers and 30 boys. Its membership was confined to boys between the ages of 12 and 17, and its object was defined as 'the advancement of Christ's kingdom among boys, and the promotion of habits of obedience, reverence, discipline, self-respect, and all that tends towards a true Christian manliness.' In its second year three other companies in Glasgow and one in Edinburgh were added to the brigade. In its third year it crossed

the border to London and Manchester, and took its first big stride, closing the year with 44 companies and 2000 boys. In its fourth year it crossed the Atlantic and took root in Canada and the United States. Since then there has been a continuous advance, so that the Boys' Brigade is established in almost every English-speaking country, and is composed of 2300 companies, each connected with a church or other Christian organisation, with a membership of 11,000 officers and staff-sergeants, and over 120,000 boys. The church connection secures the results of the brigade work within the church, and provides a responsible body upon whom the executive can depend to see that the company is carried on in accordance with the constitution.

Military organisation and drill are used as a means of securing the interest of the boys, banding them together in the work of the brigade, and promoting among them such habits as the brigade is designed to form. Other methods used are Bible-classes and Sunday services, physical training and gymnastics, ambulance classes for 'first aid to the injured,' reading and recreation rooms, swimming and life-saving instruction, and summer camps where the boys spend a week at seaside or country under the control and influence of their officers. Many thousands of boys receive a musical training in the instrumental bands of the brigade. The brigade aims at taking up everything that enters into healthy boy-life, and directing it all into channels that make for good citizenship. The governing body is the Brigade Council, composed of the captains of all the companies. The council elects annually an executive, consisting of president, vice-presidents, secretary, treasurer, and sixteen other members. In most large cities there are battalion councils, composed of local officers, for the administration of their own affairs, while the London council controls all the battalions and companies within London and the home counties.

What is here said of the Boys' Brigade is true, more or less, of all the other boys' organisations which have sprung from it, all of which are contributing their share to the moulding of the lives and characters of the rising generation. While the Boys' Brigade is inter-denominational, embracing companies connected with the Church of England, the Church of Scotland, the Church of Ireland, and all the leading branches of the Nonconformist Church, the other organisations are for the most part confined to individual churches or religious communities, such as the Church Lads' Brigade in the Church of England, the London Diocesan Church Lads' Brigade for the diocese of London, the Catholic Boys' Brigade for the Roman Catholic Church, and the Jewish Lads' Brigade for the Jewish community. Of these, the Church Lads' Brigade is the largest, with a membership of about 60,000. It is probably within the mark to say that all these boys' organisations taken together embrace not fewer than 200,000 boys, who are thus brought under healthy physical, moral, and religious training, as a direct result of the Boys' Brigade movement.

Boy Scouts were founded and organised in 1908 by General Sir Robert Baden-Powell 'to help the boys of whatever class to become "all-round" men, to give them "character," and to make them capable of looking after themselves in whatever circumstances they are placed.' Decentralisation is an important principle in their organisation. Patrols and troops are under the control of scout-masters (21 years of age) and assistant scout-masters (18 years), to whom, notwithstanding the existence of local committees, county associations, and other central machinery, a large degree of freedom is allowed as to the form that the activities

of the patrols shall take. They may specialise in ambulance, woodcraft, seamanship, or many other branches, though it is expected that they should not allow any one to exclude the rest. Scoutcraft is taken to include discipline, observation, woodcraft, health, chivalry, life-saving, and patriotism. Under woodcraft come camping, cooking, natural history, map-reading, finding one's way, boating, swimming, carpentry, cycling, and the like. In these, and in tracking animals, noticing details, interpreting small signs, judging heights and distances, and a vast variety of kindred matters, instruction is given by means of games, lectures, and competitions. On joining, a boy has to pass a test involving a knowledge of knot-tying, of the composition and use of the Union-jack, and of the scouts' laws. These laws inculcate honour, obedience to authority, courtesy, cheerfulness, avoidance of snobbery, helpfulness to others, kindness to animals, and devotion to duty. 'A scout,' says the law, 'smiles and whistles under all circumstances. When he gets an order he should obey it cheerily and readily, not in a slow, hang-dog sort of way. Scouts never groan at hardships, nor whine at each other, nor swear when put out.' A 'tenderfoot' becomes a 'second-class scout' on passing tests in first aid and bandaging, signalling, tracking half a mile in twenty-five minutes, or (if in town) describing the contents of one shop window out of four observed for one minute each, or remembering sixteen small articles out of twenty-four exposed for one minute, going a mile in twelve minutes at 'scout's pace,' laying and lighting a wood fire with not more than two matches, cooking meat and potatoes with no utensils but a billy, having at least sixpence in a savings bank, and knowing the points of the compass. Further tests of a more searching kind entitle to a first-class scout's badge. In addition there are many proficiency badges—as those of 'bee-farmer,' 'interpreter,' 'plumber,' 'musician.'

So immediate and complete was the success of the movement that after two years there were 150,000 scouts in the United Kingdom alone, and many in the colonies and on the Continent. As for its results, it was claimed that in the last six months of 1909 the average number of lives saved by Boy Scouts was five a week. In order that girls might participate in the movement, the 'Girl Guides' were founded. It has been objected that scouting tends towards militarism; but this, notwithstanding certain passages in Sir R. Baden-Powell's *Scouting for Boys*, perhaps to be explained by the author's profession and experiences, is repudiated by its leaders. Other movements, more or less similar, have been much less successful, probably because their sources were less sensitive to some of the tendencies of the time, and in particular because they were less complete expressions of the increasing boyishness of adults. Some were bound in by ecclesiastical limitations that had never counted for much in boys' eyes. Others aimed at transplanting grown-up and sometimes effete ideals to boys' minds. The Boy Scout movement is the product of a generation whose delight in physical fitness was only whetted by a disposition to see physical degeneracy in the nation; for whom active participation in sport and a delight in watching wild life were not merely matters of educational theory to be applied to the young, but a strong rejuvenating influence upon men and women; who valued bodily and mental health, activity, and freedom; who cared more for inner realities than traditional forms; and in consequence were able to meet boys on their own ground with an ideal they could understand.

Bozrah (modern *el-Busaireh*), a strong town of Edom, in the mountain district to the south-east

of the Dead Sea, about 300 B.C. capital of the Nabatæans, but now an unimportant village.

Bozzaris, MARCOS, Greek patriot, was born about 1788 at Suli, in the mountains of Epirus. His youth was spent amid the din of arms. In 1803 he was forced to retreat to the Ionian Isles by Ali Pasha (q.v.), who had nearly exterminated the Suliotes. In 1820 Ypsilanti summoned the Greeks to insurrection, and war broke out between Ali Pasha and the sultan. On learning the news, Bozzaris put himself at the head of some 800 expatriated Suliotes, and passed over into Epirus. Ali found means to secure their services against the common enemy, and Bozzaris gained several victories, and on Ali's death continued the war successfully. Shortly after, Prince Mavrocordato landed at Missolonghi with a body of disciplined troops, and being joined by Bozzaris, he engaged the Turks at Petta, 16th July 1822, but was compelled to retire to Missolonghi, which place Bozzaris skilfully defended. In 1823 a Turco-Albanian army of 13,000 men descended from the north of Epirus. Bozzaris advanced swiftly at the head of 1200 men, and on 20th August reached Karpenisi, where the van of the Turkish army, 4000 strong, was encamped. At night, 350 Suliotes burst in upon their startled foes, who were routed with great slaughter; but Bozzaris fell while leading on his men to the final attack.

Bozzolo, a town of north Italy, 14 miles WSW. of Mantua; pop. 5000.

Bra, a town of north Italy, 31 miles SSE. of Turin by rail; pop. 15,000.

Brabançonne, the patriotic song of the Belgians, originally sung by the insurgents during the revolution of September 1830. The words were written by Jenneval, a young French actor, then at Brussels, the music by Campenhout.

Brabant was the name formerly given to an important province of the Low Countries, extending from the left bank of the Waal to the sources of the Dyle, and from the Maas and the plain of Limburg to the Lower Scheldt. In the time of Cæsar, Brabant was inhabited by a mixed race of Germans and Celts; it afterwards came into possession of the Franks; and in the middle ages it formed a duchy by itself, dependent upon Lower Lorraine, with which in 1107 the county of Antwerp was incorporated, and in 1347, for a time, the lordship of Mechlin or Malines, formerly connected with Liège. After many changes, Brabant was made a part of the kingdom of Holland, at the Congress of Vienna; but since the revolution of 1830, the three provinces of Brabant have been divided as follows: (1) North or Dutch Brabant, containing 1980 sq. m. and (1920) 732,000 inhabitants; (2) the Belgian province of Antwerp, which contains 1094 sq. m. and 1,000,000 inhabitants; and (3) the Belgian province of Brabant (South Brabant), containing 1268 sq. m. and an extremely dense population of 1,600,000. The country consists of a plain gently sloping to the north-west, and rising in the south into low hills, which are offsets of those of the Ardennes. In the level northern part are many heathy and fenny tracts; one of them, a morass called the Peel, is over 20 miles in length, and from 2 to 6 broad. In the hilly district of the south is the Forest of Soignies. The Maas and the Scheldt are the principal rivers; but some of their tributaries are also very useful for internal commerce, which is further promoted by canals and railways. The soil is fertile, and grain, vegetables, and hay are extensively grown; also hops, tobacco, and chicory. Farm stock is large. The making of salt, beet-sugar, cigars, thread, woollen cloths, leather, earthenware, and soap, with printing, distilling, and turkey-red dyeing, are the chief industries.

Brabant lace has a certain celebrity. Most of the inhabitants are Catholics; those in the north are Dutch, in the middle Flemish; in the south Walloons. See a book by Onond (1907).

Brabazon, HERCULES BRABAZON (1821-92), an English country gentleman, was a water-colourist of singular power and delicacy, some of his work ranking with Turner's. See Life by Hind (1912).

Brač. See BRAZZA.

Braccio di Montone (1368-1424), called 'Fortebracci,' a celebrated Italian free-lance, born in Perugia, of an old patrician family. From his early youth he was engaged in warfare, and had already given his sword to very various causes, when in 1416 he obtained the sovereignty of his native city. The year after he held Rome for a time. Next he accepted from Queen Joanna of Naples the command of her land-forces, and soon for his services was created Count of Foggia and Prince of Capua. In 1423, by the queen's command, he was crowned at Perugia, as Prince of Aquila and Capua. His ambition now soared to the throne of Naples itself. He overran Campania and Apulia, and advanced into Calabria, but in a battle before Aquila was wounded and taken. Three days later he died.

Bracciolini. See POGGIO BRACCIOLINI.

Brace, in Carpentry, an oblique piece of wood used to bind together the principal timbers of a roof or other wooden structure. The name is also used of the curved iron tool (holding a *bët*) used by carpenters for boring. See ROOF, BORING.

Brace, CHARLES LORING (1826-1900), born at Litchfield, Connecticut, studied theology in New York, and in 1853 founded the Children's Aid Society, which ere the end of the century had provided homes for 100,000 children. He published notes of visits to Hungary, Germany, Norway, and California (1869), besides *The Races of the Old World* (1863), *Gesta Christi* (1882), and other works.

Bracegirdle, ANNE (1663-1748), an accomplished and much-esteemed actress, who played with unparalleled success both in tragedy and in comedy on the London stage till eclipsed by Mrs Oldfield in 1707. Her character stood unusually high for virtue and benevolence.

Bracelet, a personal ornament worn, like the armlet (Lat. *armilla*), by almost every nation. Among the English and other Germanic tribes of the heroic age gold bracelets served as money (see RING-MONEY), and a generous chief was commended as a ring-giver. In the authorised version of the Old Testament three different words were rendered by 'bracelet.' One of these probably means an armlet worn by men (Num. xxxi. 50, 2 Sam. i. 10); the second was a bracelet worn by women, and sometimes by men (Gen. xxiv. 22, Ezek. xvi. 11); the third a peculiar bracelet of chain-work, worn only by women (Isa. iii. 19). That referred to in 2 Sam. i. 10 was an ornament that belonged to the king, like those famous armlets with their splendid diamonds which now form part of the regalia of the kings of Persia, and which are said once to have belonged to the Mogul emperors of India. The ancient Medes and Persians were remarkable, even amongst Asiatics, for their love of ornaments of this kind; and they were worn in Europe by the Gauls and Sabines. They do not seem to have been worn by men among the ancient Greeks, but Greek ladies wore both armlets and bracelets of the most various materials and forms. Some of these went round the arm twice or thrice, and a favourite form was that of a serpent. Many examples of this kind occur on painted vases. Amongst the Romans, armlets were not usually worn by men, but were frequently conferred upon soldiers for deeds of

valour (Livy, x. 44). Roman ladies wore bracelets, not only for ornament, but also for the purpose of containing annulets, as it is said that Nero wore on his right arm the skin of a serpent, inclosed in a golden armilla. Some early armlets were evidently worn more for defence than ornament.

Brachet, AUGUSTE (1844–98), born at Lille, studied philology under Diez and Littré, and taught languages at Paris. He wrote on things Italian, but is best known for his *Grammaire Historique* and *Dictionnaire Étymologique* of the French language.

Brachial Artery is the great arterial trunk supplying the upper extremity between the armpit and the elbow; in other words, it is the direct continuation of the axillary artery. It runs down the front and inner side of the upper arm, giving off several named branches as it proceeds, and at a point about an inch below the bend of the elbow it terminates by dividing into radial and ulnar arteries. In cases of arterial bleeding from wounds of the hand or forearm, the brachial artery may be compressed against the middle of the shaft of the humerus, just behind the inner margin of the biceps muscle. See ARM, ARTERY, CIRCULATION.

Brachiopoda, a class of shelled animals having certain affinities with worms and with Polyzoa, but less with molluscs, though often included within the limits of the last-named group. The presence of two shells gives them a superficial resemblance to true bivalves (Lamellibranchs), but the shells lie dorsally and ventrally instead of right and left, and the anatomy of the inclosed organism is quite different.

History.—Naturalists were for long content with placing Brachiopods beside *Anomia* or among Lamellibranchs. Forbes and others have shown that this is impossible, and the growing tendency, due to better acquaintance with their structure and to the researches of Morse, Kovalevsky, and others on their embryology, has been to regard them as specialised and passive Annelid types. Other suggestions have not been wanting, but there is now a general consensus of opinion in defining them as one of the many offshoots from the 'worm' branch of the genealogical tree. The Tunicata have been removed from any close alliance with Brachiopods, while the Polyzoa have come to be regarded as very closely allied.

Structure.—The external form of the animal certainly suggests that of an ordinary bivalve, but, as above noted, the position of the two valves is quite different. The size varies from considerably

guldæ), glassy, or massively limy. Its structure is very much simpler than that of ordinary bivalves, and often consists of a single layer, which, in the majority, is penetrated by skin processes, which possibly have a respiratory significance. These are absent in Rhynchonellidæ and a few others, where the shell is therefore described as non-porous. The outer surface may be sculptured and coloured. The dorsal valve bears internally a limy ribbon of very varied shape, which forms the supporting organ of the respiratory apparatus. The ventral valve is in many cases provided with hinge teeth, which fit into depressions in the upper valve and lock the two halves firmly together.

The shell is secreted and lined by a delicate double membrane or *mantle*. Between the two layers there is a rich distribution of blood-vessels (the arterial system according to Huxley) which are connected with the body proper by two or four contractile heart-like organs. They communicate with the mantle-cavity, and with a chamber which occupies most of the body-cavity proper. The outer layer of the mantle next the shell often sends blind processes into canals which traverse the valves. The mantle is often strengthened by microscopic limy plates, and the margin very generally bears stiff bristles. The internal surface of the inner layer is ciliated. The body proper lies towards the hinge, and the large space between the two mantles is occupied by two large and exceedingly characteristic organs, which are probably respiratory, and certainly serve to waft little food-particles to the mouth. They consist of long tubes, bearing on one side movable cirri, and varying greatly in their degree of freedom and manner of twisting. In some cases these can be protruded through the open valves, in other cases they return upon themselves and are supported throughout by the limy ribbon above mentioned. They are tentacular, or labial organs, and arise from the outpulled margins of the mouth; in a few cases they are absent. The three or more pairs of *muscles* working the valves of Brachiopods are more complex than those of Lamellibranchs, and vary considerably in the two main divisions. The *nervous system* consists of a ring round the gullet, with superior and larger inferior pairs of ganglia, and of nerves regularly distributed to the various organs. Sense organs seem to degenerate in the very passive adults, but the young may possess eyespots, and sometimes also ear-sacs. The *alimentary system* consists of the inconspicuous mouth at the base of the long tentacles, of an ascending gullet widening into the stomach, of an associated digestive gland, and of an intestine which bends downwards, and either ends blindly or in an anus on the right side anteriorly. The *respiratory system*, as already noticed, probably consists of the processes from the mantle and of the tentacular arms, but further researches are necessary to make this certain. The *vascular system* between the mantle-layers has been already noted. The heart is usually described as a pear-shaped organ above the stomach, supplied by a main vein, and giving off

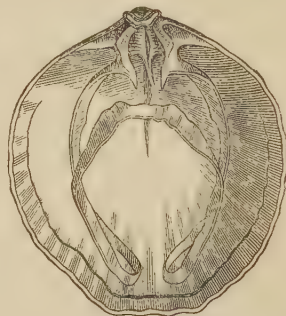


Fig. 2.—Interior of the smaller (dorsal) valve of a Brachiopod shell (*Waldheimia*), showing the limy framework which supports the arms.

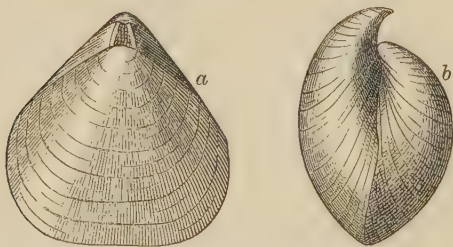


Fig. 1.—*Rhynchonella psittacea* seen from the dorsal aspect (a) and from the side (b).

under half an inch to an inch, or rarely two inches in length. The shell consists of two distinct valves, the ventral usually larger than the dorsal, and each divisible into symmetrical halves. Where the valves unite, a perforated beak is often present. Through the hole of the beak a muscular bundle passes, serving in some cases for mooring the animal. The shell may be horny (among Discinidæ and Lin-

guldæ), glassy, or massively limy. Its structure is very much simpler than that of ordinary bivalves, and often consists of a single layer, which, in the majority, is penetrated by skin processes, which possibly have a respiratory significance. These are absent in Rhynchonellidæ and a few others, where the shell is therefore described as non-porous. The outer surface may be sculptured and coloured. The dorsal valve bears internally a limy ribbon of very varied shape, which forms the supporting organ of the respiratory apparatus. The ventral valve is in many cases provided with hinge teeth, which fit into depressions in the upper valve and lock the two halves firmly together.

two arteries. The excretory system consists of a pair of tubes (compare segmental organs of other Invertebrates) to the right and left of the gut, opening internally into the body-cavity, and externally into the space between the two mantle-flaps. In *Rhynchonella psittacea* a second pair is present. These tubes serve also for genital ducts. The reproductive system is usually represented in one division by two pairs of glands, situated in sacs from the body-cavity into the mantle-cavity, and in the other division by glands near the coils of the gut. In the former the sexes are separate, in the latter the glands are hermaphrodite.

Mode of Life.—The adult Brachiopods are excessively passive organisms. Some are fixed by whole or part of their ventral valves, others seem to have been anchored in the mud by long spines, while a few are stalked either for life or in their earlier stages. The lamp-shell *Lingula*, with the longest stalk, is at the same time, as one would expect, one of the least limy, and has in fact a horny shell. *L. pyramidata* has been shown by Morse to have the power of moving along the sand, and *Terebratulina caput serpentis* has also considerable power of moving on its stalk. The nadir of passivity as expressed in enormously thick limy shells is well illustrated by the very large and massive fossil *Productidæ*. The food seems largely to consist of diatoms, but the *Lingulidæ* are also known to sweep in small crustaceans and abundance of mud. They are all marine, and attach themselves to rocks, corals, molluscs, &c.

Development.—The eggs may be laid externally, or develop within the ducts, or in *Thecidium* in a special brood-chamber. The segmented larvæ, which in some cases show marked affinities with Chatopod worms, are free-swimming and very unlike the adults. They fix themselves by their posterior portion, lose their anterior sensory region, and form the body out of the rest.

Distribution in Space.—The Brachiopods are widely distributed, but are at the same time much localised. In favourite haunts they occur in great numbers. *Lingula* abounds at above half-tide mark, while the more abundant limy forms go down to very great depths—as far as 2600 fathoms. The horny forms are fonder of warm and tropical, the limy of cold and temperate waters.

Distribution in Time.—The Brachiopods furnish a striking illustration of a moribund class. In former periods they were vastly more numerous. The hingeless forms appear first, soon accompanied by hinged types, in the Cambrian strata; in Silurian times they were exceedingly numerous; in the Devonian was their golden age. In the Carboniferous strata they are much rarer, and still more so in the Dyas. They increase again in the Jurassic, and reach another climax, sinking again in the Chalk, and gradually dwindling to the presently existing residue. Of the 125 genera and 2600 species, 17 genera and 110 species are still extant—a striking instance of decadence, which may in part be due to their extreme passivity, and also to the number of relatively trivial characters so often connected with this state. *Lingula* and some others have persisted from the earliest times.

Classification.—The Brachiopods are often divided into two orders of Testicardines and Ecardines, respectively with and without hinges. In the former it may be further noted that the shell is always limy, the mantle-flaps are united posteriorly, the gut ends blindly. In the latter the shell may be horny, there is no arm skeleton, the mantle-flaps are always separate, the gut has an anal aperture. *Terebratula*, *Thecidium*, *Stringocephalus*, *Rhynchonella*, *Spirifer*, *Strophomena*, and *Productus* are examples of the various families of the

former; *Crania*, *Discina*, *Obolus*, and *Lingula* of the latter. The absence or presence of an anus, in regard to which there is a good deal of reasoning from analogy in default of observation, is expressed in another couple of names—*Clistenterata* for the former sub-class, *Tretenterata* for the second. The terms *Articulata* and *Inarticulata* refer to the same twofold division, and emphasise the presence or absence of the locking hinge. The two terms *Testicardines* and *Ecardines* are, however, generally adopted. It has been proposed to erect a third division—*Abrachia*—for a few armless forms, in which these characteristic organs are replaced by a tentacular sheath formed from the mantle. In other respects they resemble *Testicardines*.

See Davidson, *Fossil Brachiopoda* (1859), Challenger Reports, Huxley's *Invertebrates*, and Schuchert in Von Zittel's *Palæontology* (trans. 1900-2).

Brachistochrone (Gr. *brachistos*, shortest; *chronos*, time), the curve along which a body travels from one fixed point to another in shortest time.

Brachvogel, EMIL (1824-78), German playwright and novelist, born in Breslau.

Brachycephaly. See SKULL.

Brachyura, a technical name applied to the short-tailed decapod crustaceans or crabs, in contrast to the long-tailed forms like the lobsters, where the abdomen is not tucked in on the under surface in the characteristic crab fashion. The term is also applied to a family of bats, including *Mystacina* and *Noctilio*, in which the tail is very short.

Bracken, or **BRAKE**, a large genus of Ferns of the division Polypodæ, distinguished by spore-cases in marginal lines covered by the reflexed margin of the frond. It is very widely distributed from arctic and temperate to tropical countries. The Common Brake or Bracken (*Pteris aquilina*) is the largest, commonest, and handsomest of European ferns, often covering considerable tracts in woods and parks, or on heaths and hills. It has a long, creeping, black rhizome, or root-stock, behind the apex of which a new frond arises annually. The fronds are bipinnate, but the first two pinnæ are as large as the remainder of the frond, which is moreover bent into the same horizontal plane, so producing a three-branched appearance, which is very characteristic. The fibro-vascular bundles of the stalk of the frond, when cut across, exhibit an appearance slightly resembling a spread eagle, whence the specific name *aquilina* (Lat. *aquila*, 'an eagle'); while the two dark strands of sclerenchyma in the root-stock suggest the letters J C, whence the medieval name of Christ-root, and a character of sanctity confirmed by the crozier-like unrolling of the fronds in spring. The root-stock is bitter, and has been used as a substitute for hops; it has also been ground, mixed with barley,

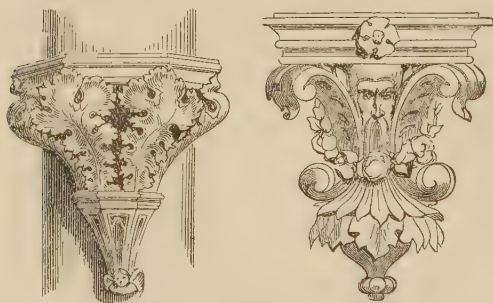


Common Brake :

a, end of a branch, much reduced; b, end of a pinna, lower side, showing fructification.

and made into a wretched bread in times of distress. It was of importance as a food-supply in Teneriffe, furnishing the so-called Helecho-bread. The plant is astringent and anthelmintic; and as such, it had at one time a high reputation in medicine, and was also employed in dressing kid and chamois leather. The ashes were formerly used in the manufacture of soap and glass. Bracken is also employed for thatching, for littering cattle, for manure, &c., and has been chopped up with straw or hay for feeding cattle. It is a favourite covert of deer and of other game. The abundance of this plant is sometimes regarded as a sign of poor land, although, probably, its absence from the richer soils is very much a result of cultivation. To extirpate it, nothing more is necessary than a few successive mowings of the young shoots as they appear. The annual growth of brake is killed by the first frosts of autumn, but remains rigid and brown, still affording shelter to game, and almost as characteristic a feature in the landscape of winter as in that of summer.—*Pteris caudata*, a large species of brake very similar to that of Europe, is one of the worst pests which the farmer has to contend with in the south of Brazil.—*Pteris esculenta*, a native of New Zealand, Tasmania, &c., has a more nutritious rhizome than the common brake (see TARA FERN).—*Pteris serrulata* of India, China, and Japan is largely used as a table decoration on account of its grace and hardness.

Bracket, an ornamental projection from a wall, used for the purpose of supporting a statue, bust, or the like (see CORBEL). Brackets are either of stone, wood, or metal, and they are sometimes



Ornamental Brackets.

elaborately designed and carved. The term bracket is also employed in joinery, &c., to designate supports, in the form of a bent knee, of shelves, galleries, &c. Bracket is also generally applied to such gaslights as project from the wall.

Bracklesham Beds, a group of highly fossiliferous strata in the Eocene system of England.

Bract is a term applied to any leaf from the axil of which a flower or a floral axis is produced, instead of an ordinary leaf-bud or branch. In some cases the bracts present no marked differences from other leaves (e.g. *Belladonna*), and such flowers are then often termed axillary, meaning in the axils of unmodified leaves. In the great majority of cases, however, the familiar antithesis between vegetation and reproduction is strongly marked, the size and vegetative development of the leaf being greatly checked; thus the bract is usually small and entire, even though the vegetative leaves may be large and divided. They often exhibit an interesting gradation between leaves and petals, for the coloration of the flowers, which is so often evident for some distance down the flowering axis, may extend more or less completely to the bract; and this may

go so far as to completely replace floral magnificence altogether, as in the *Poinsettia* and *Bougainvillea* (q.v.) of our greenhouses. The subordination of vegetative life may go so far as to suppress the parenchyma altogether at a very early age, leaving only a dead membranous structure, brown and wizened in the bract or spathe of the daffodil, or glossy and bright coloured in the immortelle and other so-called everlasting flowers. Finally, in *Cruciferae* the bracts have disappeared in the great majority of species; yet in exceptional cases (particularly in double or otherwise highly vegetative specimens), their entire or partial reappearance shows that the apparent anomaly of their absence in this family is only the extreme case of a physiological contrast which is perfectly normal. It will be noticed that the term is applied (1) to bracts proper, each subtending a single flower; (2) as in *Compositae*, to the crowded leaves of the axis below the similarly crowded inflorescence (in which, however, true bracts subtending the florets also often occur—e.g. *Zinnia*, &c., also in *Dipsacaceae*); (3) to the leaf subtending an entire inflorescence, which may be either free-growing, with minor bractlets (palm), or compressed, as in the spadix of *Araceae*. Such a bract is termed a *spathe*.

Bracton, HENRY DE, English ecclesiastic and jurist, of whom but little certain is known save that he was a 'justice itinerant,' in 1264 became archdeacon of Barnstaple and chancellor of Exeter Cathedral, and died in 1268. He is memorable as one of the earliest writers on English law, his *De Legibus et Consuetudinibus Angliæ* being indeed the first attempt at a systematic treatment of the body of English law. Coke and Selden valued the work highly, and Milton quotes from it in his *Defence of the People of England*. The first printed edition of the entire work appeared in folio in 1569. A new edition in 6 volumes (introduction, text, translations, commentary, &c.) was begun by G. E. Woodbine in 1915. In 1887 F. W. Maitland published a *Collection of Cases* (3 vols.), accompanied by a series of strong and almost conclusive arguments that this was the actual collection of cases on which Bracton's great treatise was founded.

Braddock, EDWARD, a British general, born in Perthshire, Scotland, about 1695, entered the Coldstream Guards in 1710, and was appointed major-general in 1754. Nine months later he sailed as commander against the French in America, and with a force of nearly 2000 British and provincial troops, reached the Monongahela, a branch of the Ohio, on July 8, 1755. Leaving the baggage behind, on the 9th he pushed forward with a chosen force to invest Fort Duquesne, on the present site of Pittsburg, Pennsylvania. In spite of his obstinacy, he appears to have so far regarded the warnings of his American officers that he threw out flank and advance parties to guard against a surprise. He twice forded the Monongahela in order to avoid a dangerous defile; and it was on the right bank of the river that his advance guard was attacked by a party of about 900 French and Indians from the fort. Properly speaking, Braddock fell into no ambushade; but the dense cover of the forest, of which the Indians immediately took advantage to surround his force, and his dogged insistence on his men fighting in line, instead of imitating the tactics of the foe, exposed the British as a helpless living target to a withering fire, to which they could make none but a desultory and uncertain return. After two hours' fighting, in which Braddock, whose bravery was never called in question, had four horses shot under him, and was mortally wounded while vainly trying to rally his men, the survivors made a hasty retreat under Washington, Braddock's aide-de-

camp, the only one of his staff who escaped unhurt. No less than 63 out of 86 officers, and 914 out of 1373 men engaged, were either killed or wounded. The French loss was trifling. Braddock died July 13, 1755. See Sargent's monograph (Philadelphia, 1855), and Parkman's *Montcalm and Wolfe* (1884).—The manufacturing town of Braddock, 10 miles E. of Pittsburgh (pop. 20,000), covers part of the battle-field.

Braddon. MARY ELIZABETH (Mrs John Maxwell; 1837–1915), novelist, was born in Soho Square, London, the daughter of a solicitor. She very early showed a turn for literature, which she indulged in the usual manner, by sending verses and other trifles to the magazines and newspapers. Neither a comedietta brought out at the Strand in 1860, a volume of verse, nor one or two novels had had much success, when, in 1862, *Lady Audley's Secret*, the story of a golden-haired murderess, attained an enormous popularity, in three months reaching its eighth three-volume edition. *Aurora Floyd* (1863) was little less popular. Of all her seventy-five novels, one of the best is *Ishmael* (1884), a tale of the Second Empire, which depends not so much on sensation as character. Several of them appeared in *Temple Bar*, *St James's Magazine*, and *Belgravia*, a magazine of which she was for some years editor. Mainly her works depend for their interest on incident, and the art of their appeal to 'that low vice, curiosity,' in the conduct of a story carefully leading up to some suspended and unforeseen *dénouement*. In their particular way, they display undoubted talent: in style, they are fresh and vigorous, and their narrative power strongly excites the reader's interest.

Bradfield, in Berkshire, 7½ miles W. of Reading, is the seat of a public school, St Andrew's College (1850).

Bradford, a great manufacturing city in the West Riding of Yorkshire, on a tributary of the Aire, 9 miles W. of Leeds, 34 SW. of York, and 191 NNW. of London by rail, derives its name from a ford over the river. The area of the ancient parish is 34,146 acres, and includes 13 townships. In 1899 the township of Idle was included in it. Bradford in 1832 was created a parliamentary borough, returning two members. It became a municipal borough in 1847, was constituted a county borough in 1888, and was created a city in 1897. The city has a lord mayor. The municipal borough was extended in 1873, in 1882, and in 1899, and the parliamentary borough made continuous with it in 1885. For parliamentary purposes it is now divided into 4 districts, each returning one member. The corporation has been noted for its activity and spirit of improvement shown in beneficial local acts; in the execution of main drainage-works, the remodelling of portions of the town, its splendid water-works, its gas-works, and its very complete electric system. Bradford is the chief seat in England of the spinning and weaving of worsted yarn, and the great mart for the long wools used in worsted fabrics. It has developed worsted coating, velvet, and plush industries. The first mill was built in 1798; there are now hundreds of mills, employing a large population. There are great merchants' warehouses for worsted goods; also a 'conditioning-house' (1887 and 1900) for the weight, measure, &c. of such goods. Manningham Mills, for silk and velvet, erected at a cost of £500,000, are among the most extensive in the kingdom. For the alpaca and mohair industry in the neighbourhood, see also SALT (SIR TITUS), SALTAIRE. Coal and iron mines occur near Bradford, and the ironworks at Bowling and Lowmoor are very large and important; the making of machinery is a considerable industry; and stone is exported from quarries in the neighbourhood. There are over 50 churches belong-

ing to the establishment in the borough, and more than 160 Dissenting churches. The parish church of St Peter became a cathedral when the diocese of Bradford was carved out of Ripon and Wakefield in 1918. It is a fine building in the Perpendicular style, with a tower of later date, and contains a number of interesting monuments. Bradford has a town-hall (1873; since doubled in size) of medieval design, with campanile and chimes; mechanics' institute (1870); St George's Hall (1853); exchange (1867); extensive wholesale and retail markets; good grammar-schools; technical colleges; art-gallery; free library (1872); post-office, a fine building in the Italian style (1887); and two court-houses. It has many public parks: Peel Park (with an area of 56 acres), Lister or Manningham Park (56 acres), Horton Park (39 acres), Bowling Park (53 acres), Bradford Moor Park (15 acres), Wibsey Park, Harold Park, Heaton Woods, and Oakenshaw, besides 770 acres of moorland. There are many excellent charities. The early history of Bradford is connected with the De Lacies, in whose hands the manor remained until the beginning of the 14th century, when it passed by marriage to the Lancaster family. After the death of John of Gaunt, in 1399, it was held by the crown till the reign of Charles I., who sold it to the corporation of London. After being held by the Marsdens and the Rawsons, the manorial rights were leased by the corporation. In the civil wars the people of Bradford took the parliament side, and twice defeated the royalists, but were afterwards themselves defeated by the Earl of Newcastle. The worsted trade, introduced into Bradford at the end of the 17th century, has made rapid progress since the era of the steam-engine. In a riot at Bradford against the introduction of worsted power-looms in 1826, two of the rioters were shot dead by the defenders of the mill which contained the obnoxious machinery, and many more were wounded. In 1825 a strike for increased wages, in which 20,000 persons were concerned, lasted six months. The Baptists had a college here, which has been removed to Rawdon, 6 miles distant, and the Congregationalists have the United Independent College. The town is the seat of the first English temperance society. The merchants of Bradford are distinguished by their liberality and enterprise, the names of the Listers and the Salts being conspicuous. Statues of Sir Robert Peel, Richard Oastler, Sir Titus Salt, S. C. Lister (Lord Masham), W. E. Forster (1890) have been erected. The population of the municipal borough in 1881 was 183,032; of the extended county borough (1901) 279,809; (1921) 285,979. See James's *History of Bradford* (2 vols. 1841–66); Margaret C. D. Law, *The Story of Bradford* (1913); and the *Victoria History of Yorkshire*.

Bradford, a city of M'Kean county, Pennsylvania, 65 miles S. of Buffalo, in an oil district, producing refined oils, engines, boilers, machinery, motor-cycles, &c.; pop. 15,500.

Bradford Clay, a subdivision of the Great Oolite (Lower Oolite), is a blue unctuous clay, occurring at Bradford, near Bath, and extending for a few miles around; it is about 10 feet thick at Bradford, but may be thicker at Farleigh. It is remarkable for the occurrence in it of large numbers of a Crinoid (q.v.), *Apiocrinites Parkinsoni*. The upper surface of the calcareous rock on which the clay rests is completely encrusted over with a continuous pavement formed of the stony bases of this crinoid. It had once formed the bottom of a sea, in which these animals lived, their stems bending with every motion of the water, and their star-like crown of arms outstretched in search of food. At

length, however, the clear water was invaded by a current largely charged with mud, which threw them down, and broke most of their stems off near the base. The stem, body, and arms have been dismembered, and are confusedly scattered through the clay. Although Bradford Clay is considered a local deposit, yet deposits containing the same fossils occur in Dorsetshire.

Bradford-on-Avon ('broad ford'), a town of Wiltshire, on the steep bank of the Avon, 9 miles SE. of Bath. It is an ancient town, and still shows some gable-fronted houses, built and roofed with stone. Formerly it was the seat of important woollen manufactures, and kerseymeres were first made here. The church of St Lawrence, probably 10th century, but perhaps built by St Aldhelm (q.v.) between 675 and 709, is the only perfect building of pre-Norman times now remaining in England. Only 38 feet long, it consists of a nave, chancel, and north porch, the most striking feature of the interior being the narrowness of the chancel-arch, which is not more than 3 feet across. It had been used for two centuries as a school and dwelling-house, when in 1856 it was discovered to be a church; and it has since been put in a state of thorough repair. Hard by, on the site of Aldhelm's monastery, is the parish church of the Holy Trinity (12th to 16th century; restored 1865-66). On the summit of Torr Hill are the ruins of a 14th-century chapel of the Virgin; and the town bridge retains its chapel. There is a large tithe-barn near by. In the neighbourhood is the pleasant valley of Avon, with many picturesque spots. At Bradford ('æt Bradan forða be Afne,' says the *Chronicle*), Cenwalh, king of the West Saxons, gained a great victory over the Welsh in 652. Pop. 4600. See books by W. H. Jones, Baldwin Brown, *Arts in Early England* (1903), A. G. Bradley's *Round about Wiltshire* (1907), and the *Victoria History of Wiltshire*.

Brading, a small but ancient town, once a parliamentary borough, in the Isle of Wight, 4 miles S. of Ryde by rail. The place can still show its stocks and bull-ring; and in 1880 the remains of a Roman villa, with a tessellated floor, were unearthed near the town. In the ruins, assumed to be those of the villa of the Roman governor, were found numerous coins and tiles; there are also traces of a whole row of buildings.

Bradlaugh, CHARLES, a prominent social reformer, but vigorous anti-socialist, was born in London in 1833. He had early to shift for himself, and was in turn errand-boy, small coal-merchant, and trooper at Dublin. Procuring his discharge, he returned to London in 1853, became clerk to a solicitor, and ere long a busy secularist lecturer, and pamphleteer under the name of 'Iconoclast.' His voice was heard in all popular causes, alike on platforms throughout the country and in the pages of his organ, *The National Reformer*; but in 1880 his name assumed a new importance on his being elected M.P. for Northampton. He claimed to make affirmation of allegiance in lieu of taking the parliamentary oath; but after the report of two select committees, the House refused to allow him either to make oath or to affirm. He continued his struggle with the House, was thrice re-elected by Northampton, and at length, in 1886, having taken the oath, he was allowed to take his seat. In parliament he gained respect by his strong sense and debating power, and he earned wide popularity by his agitation against perpetual pensions. Of his writings the best known is the *Impeachment of the House of Brunswick*. His republication, in conjunction with Mrs Annie Besant, of an old pamphlet, *The Fruits*

of Philosophy—a proposed solution for the over-population question—led in 1876 to a sentence of six months' imprisonment and a £200 fine, but the conviction was quashed on appeal. He died 30th January 1891.

See OATH, and his *Life* by his daughter, Mrs Bonner, and J. M. Robertson (1894).

Bradley, ANDREW CECIL, born in 1851, was in 1901-6 professor of poetry at Oxford. He published *Poetry for Poetry's Sake* (1901), *Shakespearean Tragedy* (1904), and *Oxford Lectures on Poetry* (1909).

Bradley, EDWARD ('Cuthbert Bede'; 1827-89), born at Kidderminster, and educated at Durham University, was successively rector of Denton, of Stretton, and of Lenton, near Grantham. His facetious description of Oxford life in *Adventures of Verdant Green* (1853-57) had several successors.

Bradley, FRANCIS HERBERT, philosopher, was born in 1846, half-brother of Dean Bradley. He was educated at Marlborough, and is a fellow of Merton College, Oxford. He has written *The Presuppositions of Critical History* (1874), *Ethical Studies* (1876), *Principles of Logic* (1883), *Appearance and Reality* (1893), *Essays on Truth and Reality* (1914).

Bradley, GEORGE GRANVILLE (1821-1903), teacher and dean, was educated at Rugby and University College, Oxford, of which he became a fellow in 1844. He was assistant-master at Rugby (1846-58), headmaster of Marlborough until 1870, when he became head of University College. From 1881 to 1902 he was Dean of Westminster, successor to his friend Stanley, to whose *Life* he contributed. He wrote also *Aids to Latin Prose Composition*, and *Lectures on Job and Ecclesiastes*.—His daughter, MARGARET LOUISA WOODS, born in 1856, has shown dramatic power and tragic force in verse (*Collected Poems*, 1914) and novels.

Bradley, HENRY, philologist (b. 1845), was born in Manchester, and educated at Chesterfield Grammar School. After engaging in teaching and in commercial work at Sheffield, he removed to London in 1844, and wrote for literary journals. He has several times been president of the Philological Society, has edited English texts and philological works, and since 1889 has been joint-editor of *The Oxford English Dictionary*.

Bradley, JAMES (1693-1762), was born at Sherborne, Gloucestershire, and studied at Balliol College, Oxford. His genius for mathematics and astronomy won him the friendship of Halley and Sir Isaac Newton, and secured his election to the Royal Society (1718). In 1721 he was elected Savilian professor of Astronomy at Oxford. In 1729 he published his theory of the aberration of the fixed stars, containing the important discovery of the aberration of light. His next discovery (1748) was that the inclination of the earth's axis to the ecliptic is not constant, a fact including the explanation of the precession of the equinoxes and the nutation of the earth's axis. In 1742 he succeeded Halley at Greenwich. He has been called the founder of observational astronomy; his astronomical observations numbered about 60,000.

See the memoir in Rigaud's edition of the works and correspondence, and Turner's *Astronomical Discovery* (1905).

Bradshaw, GEORGE (1801-53), originally a map-engraver in Manchester, on 19th October 1839 commenced the issue of an occasional work, called *Bradshaw's Railway Time-tables* (from 1840 *Railway Companion*), which was corrected by a monthly timesheet. By great efforts the railway companies were induced to consent to adjust their tables, once for all, for the beginning of each month; and the first

number of the monthly *Railway Guide* was brought out in December 1841, though the *Companion* survived till 1845. The second number of the *Guide*, published '1st month (January) 1842,' runs to 32 pages, and contains 42 or 43 lines of railway, in England only, without any advertisements. In 1847 the first number of *Bradshaw's Continental Railway Guide* was issued, which, in addition to the tables, gives topographical information. Bradshaw, who was an active philanthropist and a member of the Society of Friends, died of cholera near Christiania.

Bradshaw, HENRY (1831-86), bibliographer, antiquary, and scholar, was born in London, and educated at Eton and King's College, Cambridge. He assisted in Cambridge University Library, 1856-58, 1859-67, and in 1867 became librarian. His bibliographical faculty amounted to genius, and led to many brilliant discoveries, including *The Book of Deer*, and two unrecorded works ascribed by him to John Barbour. He was an authority on Chaucer, on ancient Celtic, and on many departments of bibliography. His *Collected Papers* appeared in 1889. The Henry Bradshaw Society edits liturgical texts. See *Life* by Prothero (1889).

Bradshaw, JOHN, regicide, was born near Stockport in 1602, called to the bar at Gray's Inn, and in 1649 appointed president of the high court of justice for the trial of Charles I. On that solemn occasion his manners were as short as his speeches were lengthy. For reward he was made permanent president of the Council of State, and Chancellor of the Duchy of Lancaster, with a grant of estates worth £2000 per annum. His 'stiff republicanism' embroiled him with Cromwell, who twice attempted to deprive him of his office of chief justice of Chester; but there is no direct proof that he ever engaged in the Fifth Monarchy and other plots. After Oliver's death he was appointed a commissioner of the Great Seal; and his last public act was to protest against the violent seizure of Speaker Lenthall by the army. He died 22d November 1659; and his body was buried with pomp in Westminster Abbey, but after his posthumous attainder, it was disinterred and hung on a gibbet, with those of Cromwell and Ireton.

Bradstreet, ANNE. See UNITED STATES (*Literature*).

Bradwardine, THOMAS, was born in England not later than 1290. His birthplace is uncertain; in his chief work he mentions that his father lived at Chichester. He studied theology, philosophy, and mathematics with distinguished success at Merton College, Oxford, and in 1325 was one of the proctors of the university. His fame as a theologian was founded on lectures he delivered at Oxford, and now rests on his *De Causa Dei contra Pelagium, et de virtute causarum, libri tres* (edited by Henry Savile, Lond. 1618), an able defence of the Augustinian doctrines of grace, fully proving his right to the scholastic title of 'Doctor profundus.' Called to the court of Edward III. by Stratford, Archbishop of Canterbury, he became confessor to the king, canon of Lincoln, and chancellor of St Paul's Cathedral. From 1338 he accompanied Edward III. on his campaigns in France. On the death of Stratford in 1348, Bradwardine was elected his successor by the chapter of Canterbury. The king and the pope preferred John Ufford; but Ufford dying in May 1349, before he had been consecrated, Bradwardine was appointed archbishop, and was consecrated in July by Cardinal Bertrand at Avignon. Returning to England, he died on the 26th August in that year. Bradwardine wrote also *Arithmetica Speculativa* (Paris, 1502), *Geometria Speculativa* (ib. 1512), and a *Tractatus Proportionum* (Venice, 1505).

Brady, NICHOLAS, with Nahum Tate, versifier of the Psalms, was born at Bandon, County Cork, in 1659. He was educated at Westminster, Christ Church (Oxford), and Dublin, and held from 1696 to his death in 1726 the living of Richmond, Surrey, along with the rectories of Stratford-on-Avon and Clapham in succession. He also kept a school at Richmond, honoured by the approval of Richard Steele. Tate and Brady's metrical version of the Psalms was authorised in 1696, but with the strong opposition of many among the Tory clergy. His tragedy, *The Rape, or the Innocent Imposters*, his blank verse *Aeneid*, and his sermons have long since sunk into the oblivion they deserved.

Bra'dypus. See SLOTH.

Braemar, a Highland district, occupying the south-west corner of Aberdeenshire (q.v.), in the heart of the Grampian Mountains, and traversed by the upper waters of the Dee. In the east part is Balmoral (q.v.); and near its centre, 61 miles W. by S. from Aberdeen, is the small village of Castleton of Braemar, a favourite resort for travellers, sportsmen, and lovers of grand scenery. Here in 1715 Mar raised the Pretender's standard.

Brag, a game at cards, so called because each player endeavours to impose upon the others, and to make them believe that his hand is better than it really is. A sum of money is usually staked, and the cards being compared, the best hand wins.

Braga, THEOPHILO, born in the Azores in 1845, was already prominent as a poet, historian, and writer on philosophy, ethnology, and other subjects when, on the revolution of 1910, he became first (provisional) president of the Portuguese republic. On the resignation of Arriaga he was again elected for the remainder of the term of office (1915).

Braga, a city of Portugal, capital of a district in Minho, is situated on an eminence 34 miles N.E. of Oporto. It is the residence of the primate of Portugal, who claims to be 'primate of all the Spains.' It has also a fine Gothic cathedral (12th century), partly modernised, the church of Santa Cruz (1642), and manufactures of linen, hats, cutlery, firearms, jewellery, &c. The *Bracara Augusta* of the Romans, it retains ruins of a temple, an amphitheatre, and an aqueduct. Near it is the celebrated *Sanctuario do bom Jesus do Monte*, which is still a place of pilgrimage. In the 6th century Braga was the chief city of the Suevi, and it fell successively into the hands of the Goths and Moors, from the latter of whom it was taken by Alphonso of Castile. Pop. 25,000.

Bragança, the name of two considerable towns in Brazil. (1) Bragança, a seaport, 100 miles N.E. of Pará, at the mouth of the Caite, which is navigable to the town. Pop. of town and district, 20,000.—(2) Bragança, an inland city of about 10,000 inhabitants, 50 miles to the N.E. of São Paulo.

Braganza, or BRAGANÇA, a city of Portugal, capital of a district in Traz-os-Montes, on the Fervença, 26 miles N.W. of Miranda. It has an upper and a lower town, the former being surrounded with walls; has a citadel, a college, a hospital; is the see of a bishop; and has manufactures of silk and velvet. This city gives its name to the House of Braganza, the former ruling dynasty in Portugal and Brazil, John, 8th Duke of Braganza, having ascended the throne as John IV. in 1640, when the Portuguese liberated themselves from the Spanish yoke. His daughter, Catherine of Braganza, was the queen of our Charles II. See PORTUGAL. Pop. 5000.

Bragg, BRAXTON (1817-76), Confederate general, born in North Carolina, graduated at the United States military academy in 1837, served in

the artillery through the Seminole and Mexican wars, rising by successive brevets for gallantry in action to the rank of lieutenant-colonel, and retired in 1856. He commanded in several great battles of the Civil War, and was for a time military adviser to the Confederate president.—His brother, THOMAS (1810–72), was governor of North Carolina, 1854–58, United States senator, 1859–61, and Attorney-general in Jefferson Davis's cabinet, 1861–63.

Bragg, SIR WILLIAM HENRY, born at Wigton, Cumberland, 2d July 1862, was third wrangler at Cambridge, professor of Physics at Adelaide (1886), Leeds (1909), and London (1915). With his son WILLIAM LAWRENCE BRAGG (born at Adelaide 1890; professor of Physics at Manchester 1919) he studied crystal structure by means of X-rays. He contributed to this Encyclopædia.

Bragi, in Northern Mythology, son of Odin and Frigga, god of poetry and eloquence. Upon his tongue were engraved the runes of speech, so that he could not utter a sentence that did not contain wisdom. According to the elder or poetic Edda, he is the most perfect of all scalds or poets, and the inventor of poetry, which is designated by a kindred word, *bragr*. Unlike Apollo, who in Greek mythology enjoys eternal youth, Bragi is represented as an old man with a long flowing beard; but his brow is always mild and unwrinkled. His wife's name is Idunna. Together with Hermothr or Hermode, he receives and welcomes all those heroes who have fallen in battle, on their arrival at Valhalla. On festive occasions, as well as on the burial of a king, a goblet, called Bragafull (Bragi's goblet), was presented, before which each man rose up, made a solemn vow, and emptied it.

Braham (i.e. ABRAHAM), JOHN (c. 1774–1856), born in London of German-Jewish parents, was early left an orphan, and is said to have sold pencils in the streets, but for half a century was one of the highest reputed of tenor singers. He made a large fortune, but lost it in theatrical enterprises. His compositions are unimportant, but 'The Death of Nelson' is not yet forgotten.

Brahé, TYCHO, a great astronomer, was born at Knudstrup, near Lund, 14th December 1546. He was descended from a noble family, and was sent at the age of thirteen to the university of Copenhagen, where he had not been more than a year, when an eclipse of the sun turned his attention to astronomy. His uncle, who destined him for the law, furnished him with a tutor, and sent him to Leipzig in 1562; but Brahé, who cared nothing for that study, devoted just so much time to it as would save appearances, and while his tutor slept busied himself nightly with the stars. By these surreptitious observations of the heavens, and with no other mechanical contrivances than a globe about the size of an orange, and a pair of rude compasses, he succeeded, as early as 1563, in detecting grave errors in the Alphonsine tables and the so-called Prutenic (i.e. Prussian) tables, and set about their correction. The death of an uncle, who left him an estate, recalled him to his native place in 1565; but he very soon became disgusted with the ignorance and arrogance of those moving in the same sphere with himself, and went back to Germany. He resided for a short time at Wittenberg and Rostock, and lost part of his nose in a duel, but contrived an artificial one. After two years spent in Augsburg, he returned home, where in 1572 he discovered a new and brilliant star in the constellation Cassiopeia. In 1573 he married, or took as concubine, a peasant girl. This his fellow-noblemen thought even more undignified than being addicted to astronomy; and the king was obliged to inter-

pose in order to reconcile them. After some time spent in travel, Brahé received from Frederick II. the island of Hven or Høene, in the Sound, as the site for an observatory, the king defraying the cost of erection, and of the necessary astronomical instruments, and providing a salary. In 1576 the foundation-stone of the castle of Uraniborg ('fortress of the heavens') was laid. Here James VI. of Scotland paid him a visit, and wrote some verses in his honour, and here for a period of twenty years Brahé prosecuted his observations with the most unwearied industry—with a zeal, in fact, sufficient to create a new epoch—one of the three great epochs indeed—in astronomy as a science of observation. See ASTRONOMY, COMET. The scientific greatness of Brahé was no protection against the petty prejudices of the nobles. So long as his munificent patron, Frederick II., lived, Brahé's position was all that he could have desired, but on his death in 1588 it was greatly changed. For some years under Christian IV., Brahé was just tolerated; but in 1597 his persecution (partly ascribed to his own arrogant ways) had grown so unbearable that he left the country altogether. After residing a short time at Rostock and at Wandsbeck near Hamburg, he accepted an invitation of the Emperor Rudolf II.—who conferred on him a pension of 3000 ducats—to Benatek, near Prague; but he died at Prague on the 24th October 1601. At Benatek his assistant was Kepler, who owed much to his advice. He did not accept the Copernican system. The scientific publications of Brahé are numerous. His complete works appeared at Prague in 1611, and another edition was begun in 1914 by J. L. E. Dreyer (Copenhagen); his Letters have been edited by Frijs (Copenhagen, 1876); and there are Lives of him by Gassendi (Latin, 1655), Frijs (Danish, 1871), and Dreyer (English; Edin. 1890).

Brahilov. See BRAILA.

Brahma. In the religion and philosophy of the Hindus, this word has two meanings. The crude form is *brahman*, the etymological signification of which seems to be *expansion*, with the secondary meaning of *religious devotion*. *Brahmā* (neuter) designates the universal Spirit, the ground and cause of all existence; which is not, however, conceived as an individual personal deity to be worshipped, but only as an object of contemplation. It is spoken of as 'that which is invisible, unseizable, without origin, without either colour, eye, or ear, eternal, manifold (in creation), all-pervading, undecaying—the wise behold it as the cause of created beings.' The human soul is a portion of this universal Spirit, and a man can only be freed from transmigration, and be reunited to *Brahmā*, by getting a correct notion of it and of the soul.—*Brahmā* (masculine) signifies an *offerer of prayer*, a *priest*, as well as the Supreme Being regarded as a person. In the later mythology he became the chief god of the Hindu pantheon, and is specially associated with the function of creation (see TRIMURTI). Yet he himself is a creation of or emanation from *Brahmā*, the First Cause. The origin of *Brahmā*, and the way in which he created heaven and earth, is thus narrated by Manu:

'This universe was enveloped in darkness, unperceived, undistinguishable, undiscoverable, unknowable, as it were entirely sunk in sleep. Then the irresistible self-existent Lord, undiscerned, causing this universe with the five elements, and all other things, to become discernible, was manifested, dispelling the gloom. He who is beyond the cognisance of the senses, subtle, undiscernible, himself shone forth. He, desiring, seeking to produce various creatures from his own body, first created the waters, and deposited in them a seed. This [seed] became a golden egg, resplendent as

the sun, in which he himself was born as Brahmā, the progenitor of all the worlds. Being formed by that First Cause, undiscernible, eternal, which is both existent and non-existent, that Male (purusha) is known in the world as Brahmā. That lord having continued a year in the egg, divided it into two parts by his mere thought. With these two shells he formed the heavens and the earth; and in the middle he placed the sky, the eight regions, and the eternal abode of the waters.'

In later times at least, Brahma has had few special worshippers, the only spot where he is periodically adored being at Pushkara in Rajputana. He sometimes receives a kind of secondary homage along with other deities. Brahma is represented with four heads. See INDIA (section on *Religion*), TRIMURTI, VISHNU, SIVA.

Brahman, or **BRAHMIN**, the name of the highest Caste (q.v.) in the system of Hinduism. For Brahminism, see INDIA.

Brahmanbaria, a town of India, Tipperah district, in the presidency of Bengal, on the Titas River, 230 miles NE. of Calcutta, with which it has communication by rail and river. There is a large trade in rice. Pop. 22,300.

Brahmaputra ('son of Brahma'), one of the great rivers of India, rises, as the Kubi-Tsangpo, at the foot of a glacier on the slopes of the Kubi-Gangri, in Tibet, 15,958 feet above sea-level, close to the source of the Sutlej, and not very far from those of the Indus and the Ghāgra. For 800-900 miles the Tsangpo flows eastwards through Tibet, in the trough between the Himalaya and Trans-Himalaya, leaving Shigatze a little to the south and Lhasa to the north on tributaries. In a late geological period it is believed to have continued in this direction towards China, but the formation of north-and-south folds of mountains stretching from eastern Tibet into Burma diverted its course. It accordingly bends somewhat tortuously, but in a general south-easterly direction, round the eastern flank of the Himalayas (Namcha Barwa, 25,445 feet), through a gorge unexplored till 1913, and enters the valley of Assam as the Dihang. Receiving the Dibang and the Lohit at the head of the valley, it flows south-west and west for 450 miles between the forest-clad lower slopes of the Himalayas and the Khasia and Garo plateau. Some distance down the valley it receives the Subansiri from Tibet, and the united stream is believed to have a flood discharge of over 500,000 cubic feet per second. Enormous quantities of fertilising silt brought down from the Himalaya are deposited in banks and islands that are subject to constant change, though the valley is not wide enough to allow changes of such magnitude as occur in the delta. The channel divides up into a network of branches, running upon an elevated platform of alluvium, and bordered by great stretches of swamp which become a continuous sheet of water in the rainy season. Emerging upon the plains of eastern Bengal, the river turns southwards round the western end of the Khasia Hills, and, under the name of Jamūna, flows 180 miles to Goalanda, where it unites its delta with that of the Ganges. The Surma, from Cachar in southern Assam, joins the main stream of the united rivers to form the Meghna, which, 75 miles below Goalanda, opens out into the Bay of Bengal. The Brahmaputra is navigable for steamers as high as Dibrugarh in Upper Assam, 800 miles from the sea. By far the most important export traffic in Assam is that in tea; but large quantities of timber, rubber, and cotton are also sent down the river. The overflow of the Brahmaputra upon the plains renders artificial irrigation unnecessary, and enables

abundant crops of rice to be grown. This is largely sent up-stream to the tea-estates. The gold found in the Tertiary deposits and alluvial beds of the Dihang and its affluents has long been famous. That of the main stream is probably brought down from crystalline rocks in its upper reaches in Tibet. For the upper valley and the discovery of the source, see Hedin, *Trans-Himalaya* (1909).

Brahma Samāj (i.e. 'Church of the one God,' 'Theistic Church') is a religious and social association in India, originated by the celebrated Hindu raja, Rammohun Roy (q.v.), in 1830, under the title *Society of God*. The accession of Debendranath Tagore, a wealthy Calcutta Brahman, in 1842, gave the movement a great impetus, which was also much aided by the spread of English education. Its main development took place under Babu Keshub Chunder Sen, born in 1838, who died in 1884. He joined the new church in 1858, and visited Europe in 1870. It was his aim to apply the principles of the church to practical life, and under his leadership the progressive party seceded from the original church, and assumed the title of 'Brahma Samaj of India.' Their fundamental principles are that there is but one Supreme God, the object of worship; that nature and intuition are the sources whence our knowledge of God is derived; they reject all special revelation, and hold that religion admits of progressive development. They ignore all distinctions of caste, and consider all men as God's children; they abjure all idolatrous rites, and acknowledge no sacred books or places, but value what is good and true in all religions, and recognise the necessity of public worship. They have reformed marriage customs and promoted female education. Keshub believed himself to be a prophet and proclaimed the 'New Dispensation,' which in some respects approximated to Christianity, but in his later years he inclined more to mysticism, pantheism, and Yogaism. Many of his followers resented the inevitable inconsistencies of his eclectic theology and his too autocratic rule; and when, in defiance of the accepted principles of the society, he married his fourteen-year-old daughter to a Hindu raja, a large section seceded and founded the Sadharana (Universal) Brahma Samaj, the most progressive school or division. The original and most conservative section, dating from before Chunder Sen's adhesion, still lived on; and though after his death (1884) the three—or with the small Prarthna Samaj in Bombay, four—Samajes resumed more friendly relations, the results have fallen far short of the founder's hopes and friends' expectations. In Rabindranath Tagore, the greatest living poet of India, the Brahma Samaj has contributed also to English poetry.

The Brahma Samaj must be distinguished from the newer but vastly larger Arya Samaj (q.v.), but they have a Vedantic Unitarianism in common. And the effect of both has been, in the opinion of the best observers, to bar the way to the evangelisation of educated India.

See books by and about Rammohun Roy (q.v.) and Chunder Sen; F. Lillingston, *The Brahma Samaj and the Arya Samaj* (1901); Pandit Sivanath Sastri, *History of the Brahma Samaj* (2 vols., Calcutta, 1912); J. C. Oman, *The Brahmans, Theists, and Muslims of India* (1907); Hastings's *Encyclopedia of Religion and Ethics* (1912). For the Vedantic and Indian philosophy on which they base, see SANSKRIT, INDIA (*Religion*).

Brahmin Ox. See ZEBU.

Brahms, JOHANNES, was born on 7th May 1833, in Hamburg. His father, Johann Jacob Brahms, a Holsteiner and an enthusiastic professional musician, settled in Hamburg (1826), where he married (1830) Johanne Henrika Cristiane Nissen, a woman of little education and nearly

seventeen years his senior, but a devoted wife and mother. Johannes, the second of three children, received his musical education from his father, Otto Cossel, and Eduard Marxsen, a noted teacher and composer of the day. In 1847-49 Brahms made several public appearances, and gained a considerable reputation as a pianist. From childhood he tried his hand at compositions and arrangements, but his first works of importance date from the early 'fifties, to which years belong the E flat minor Scherzo, Sonatas C major and F sharp minor for pianoforte, and such well-known songs as 'Liebestreu' and 'Heimkehr.' Many of his earlier MSS. were signed E. W. Marks, Karl Würth, or Johs. Kreisler, jun. In 1853 the Hungarian violinist, Eduard Reményi, undertook a concert tour with Brahms as accompanist. Thanks to Joachim, Reményi and his accompanist received a cordial welcome from Liszt at Weimar. Brahms then spent some weeks with Joachim in Göttingen, where were laid the foundations of a lifelong and ideal friendship.

Armed with an introduction from Joachim (ever eager to promote his friend's musical fame and material welfare), Brahms visited Robert and Clara Schumann in September at Düsseldorf. Schumann, all enthusiasm, contributed a historic article, 'Neue Bahnen,' to the *Neue Zeitschrift für Musik* (23d October 1853), in which he hailed Brahms as the coming Messiah in music. This panegyric inevitably alienated the New-German party, of which Liszt was a leader, and for some time at least Schumann's kindness did Brahms more harm than good. Ere the year was out the young composer for the first time found a publisher (at Leipzig). In 1854 he settled at Hanover, where he finished his beautiful B major trio (the first of a series of great chamber works) and attempted a symphony; the failure of the latter, which eventually became part of the D minor pianoforte Concerto, caused him to apply himself for several years to a strict course of study before giving the world any new compositions. From 1857-60 he held the posts of director of the court concerts, and conductor of the choral society at Detmold. His performance of the now well-known D minor pianoforte Concerto at Leipzig in 1859 was 'a complete and brilliant failure,' as he himself reported to Joachim. Not till many years later did this interesting work, which boldly disregarded the traditional concerto form, receive the appreciation it deserved. This rebuff stimulated and in no wise daunted Brahms, who declared: 'Nevertheless the concerto will some day be a success.'

In 1862 Brahms paid his first visit to Vienna. The Austrian capital greatly attracted him, and soon became his permanent home, his hopes of being appointed conductor of the Hamburg Philharmonic Society never being fulfilled. He accepted the leadership of the Vienna Singakademie in 1863, but resigned after one season's work. In 1872-75 he conducted the concerts of the Vienna Gesellschaft der Musikfreunde. In striking contrast with Wagner, Brahms led a retired and placid life. An occasional concert tour or holiday trip (to Baden-Baden, the Austrian Alps, Italy, &c.) alone interrupted the even tenor of his life and work at No. 4 Karlsgasse, Vienna, where he resided for over a quarter of a century. Fame and honours, however, came unsought. In 1879 the degree of Ph.D. was conferred upon him by Breslau University; in 1887 he was created Knight of the Order Pour le Mérite; in 1889 he received the freedom of his native city; Cambridge offered him an honorary degree, but Brahms could never be persuaded to visit England. He died of cancer of the liver on 3d April 1897, and was buried in the Central Cemetery, where Beethoven and Schubert also lie.

A man of high ideals and admirable character,

Brahms was modest, contemplative, and reserved, and disliked publicity of any kind. Behind an abrupt and somewhat irritable manner lay a kind and generous nature, a genuine capacity for friendship (witness his relations with Joachim, the Herzogenbergs, and the Schumanns), and a well-balanced and healthy mind. Brahms never married; he was, however, exceedingly fond of children. A great lover of nature (as his music amply proves), he was an early riser and an enthusiastic walker. His constitution was remarkably robust. Of medium height and square build, Brahms had a great impressive head with lofty brow and keen blue eyes.

His arrival in Vienna inaugurated the most fertile and brilliant period of his career. Before that date his only works for orchestra alone were the two serenades (published 1860). The next ten years were marked by a series of masterly chamber compositions and vocal works—e.g. string sextet, op. 18; quartets, op. 25, 26; the fifteen Magelone Romances, op. 33; pianoforte quintet, op. 34; horn trio, op. 40; and three songs for six-part chorus, op. 42. The first performance of the imposing German Requiem, a work in seven movements for soli, chorus, and orchestra, took place in Leipzig in 1869, and won for Brahms an undisputed place in the front rank of composers. The 'Rhapsodie' (1870), the 'Triumphlied' (1871), written in honour of German victories, and the sublime 'Schicksalslied' (1871) completed the period of Brahms's greatest choral works. His first symphony (C minor) was produced in Carlsruhe, 1876 (pub. 1877), and was followed immediately by the second symphony (D major), performed in Vienna, 1877. The former aroused considerable controversy at the time, but is now regarded by many as his finest symphony; perhaps nowhere else does Brahms reveal such mighty power of construction, such a careful choice and logical development of his themes. Amongst the most notable of the compositions which now appeared are his solitary violin concerto, first performed by Joachim in Leipzig, 1879, the delightful sonata in G major for pianoforte and violin, the 'Academic' and 'Tragic' overtures, and the exacting pianoforte concerto in B flat, op. 83.

Many of the master's most ambitious works were produced in pairs. His last two symphonies, like his first two, followed closely one upon the other—the F major performed in Vienna, 1883, the E minor in Meiningen, 1885. The intervening period was prolific in vocal works. The E minor symphony, with its unsurpassed fourth movement in passacaglia form, is the last of Brahms's compositions for orchestra alone. Besides this monumental movement, the famous Händel Variations and Fugue, op. 24, variations on an original theme, op. 21, for pianoforte, and the orchestra variations, op. 56, among others, make him pre-eminent as a writer of variation form. Brahms's last ten years, like the decade 1861-70, were particularly rich in exquisite chamber compositions and songs, and yielded, *inter alia*, the double concerto for violin and violoncello with orchestra accompaniment, op. 102, the well-known pianoforte pieces, op. 116-119, the four serious songs for bass, published a year before his death, and the eleven Choralvorspiele for organ (his only posthumous work).

During his lifetime Brahms met with more recognition than has been the lot of many master musicians, and then, as now, the best judges agreed that he must be assigned a place among the great classical composers. His name is often, and not unwarrantably, bracketed with those of Bach and Beethoven, who with Mozart were his constant exemplars. By dint of ceaseless self-criticism he became unimpeachable in form and manner of construction. To the technical skill of his compositions

were added a poetic unity, a depth and purity of conception, and a rich store of thematic material. It is especially in his symphonies and in his beautiful chamber-music that he combines so wonderfully the classic form with the modern spirit. As a song-writer he ranks with Schubert and Schumann. Such masterpieces as 'Feldeinsamkeit,' 'Mainacht,' 'Von ewiger Liebe,' 'Botschaft,' 'Auf dem Kirchhofe,' illustrate his genius for expressing a mood in music. Altogether he wrote nearly 200 lieder, besides 49 volkslieder and 14 volks-kinderlieder. For German folk-songs (as for Strauss waltzes) Brahms always had an intense liking. He never attempted an opera, as he could not find a libretto to his satisfaction.

Among the most striking peculiarities of Brahms's music are his frequent use of syncopation and of conflicting rhythms, and his partiality for themes built on the notes of the tonic chord. These characteristics, together with his power of condensation, his exhaustive treatment of his material, his eschewing of the purely sensuous side of music, and perfect control of the emotions by the intellect, his invariable refusal to forsake classical ideals and pander to popular tastes, may render some of his works cold, obscure, or monotonous to the average listener; but to the initiated Brahms will ever appeal as the 19th century's greatest exponent of absolute music after Beethoven.

The standard German biography is Max Kalbeck's, in 4 vols. (1904-14). See also Florence May, *Life*, 2 vols. (1905); E. Evans, sen., *Historical, Descriptive, and Analytical Account of J. Brahms's Works* (1912 et seq.); studies by J. A. Fuller-Maitland (1911) and E. Markham Lee (1916); and Brahms's Correspondence with Joachim, the Herzogenbergs, and others (*Briefwechsel*, 7 vols. 1907-12). *The Herzogenberg Correspondence* appeared in English in 1909.

Brahui, a people of Beluchistan, whose affinities are obscure. See BELUCHISTAN.

Braid, JAMES, born in 1795 in Fife, studied medicine at Edinburgh, and settled as a surgeon in Manchester, where he died, 25th March 1850. He is noted for his researches on Animal Magnetism (q.v.), which he called Hypnotism (q.v.).

Braidwood, THOMAS, born in 1715, studied at Edinburgh University. He settled as a school-master in Edinburgh, and after 1760 became famous as a teacher of the Deaf and Dumb (q.v.). His school, which was visited by Dr Johnson, was afterwards transferred to Hackney, London, where Braidwood died, 24th September 1798.

Braila, or BRAILOV, a river-port of Rumania, on the left bank of the Danube, 10 miles above Galatz, and 142 NE. of Bucharest by rail. A free port till 1883, it exports large quantities of corn, timber, petroleum, and other products. Of its churches the chief is the Orthodox cathedral. The fortifications were dismantled in 1828. There are mineral springs in the neighbourhood. Braila was burned by the Russians in 1711, and Gortschakoff crossed here in 1854. Pop. 66,000.

Braille, LOUIS. See BLIND.

Brailsford, HENRY NOEL, author and journalist, born at Mirfield in 1873, studied at Glasgow, where he became lecturer in logic; wrote for the *Manchester Guardian*, *Tribune*, *Daily News*, and *Nation*; was Labour candidate for Montrose burghs (1918); and in 1922 became editor of the *New Leader*. His books include *Macedonia* (1906); *Shelley, Godwin, and their Circle*; *The War of Steel and Gold* (1914); and other works on international questions and war.

Brain is the term applied to that part of the central nervous system which in vertebrates is contained within the cranium or skull. In the invertebrata it is represented by the nervous ganglia near

the head end of the body. The human brain is enveloped by three membranes—the *Dura-mater*, the



Fig. 1.—Cerebrum—upper surface (Quain):

To show, firstly, division into two nearly equal hemispheres by the great median fissure; secondly, general appearance and apparent irregularity of arrangement of the convolutions and fissures; F.L., frontal lobe; O.L., occipital lobe.

Arachnoid, and the *Pia-mater*. These support the blood-vessels which nourish the cranium and

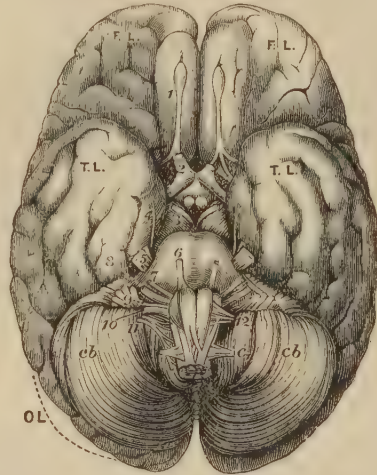


Fig. 2.—Under Surface, or Base of Brain:

F.L., T.L., O.L., frontal, temporal, and occipital lobes of the cerebrum; cb, cb. cerebellum, the medulla oblongata lying between its two lobes. *Cranial Nerves*.—1, olfactory lobe (the nerve of smell); 2, optic nerve (nerve of sight); 3, third or oculo-motor nerve, motor nerve to most of the muscles of the eye; 4, fourth or trochlear nerve, motor nerve to the superior oblique muscle of the eye; 5, fifth, trigeminal, or trifacial, sensory and motor, the large root sensory to the face and eyes, &c.; the small root, motor to muscles of mastication; 6, sixth or abducent nerve, to external rectus muscle of eye, turns eyeball outwards; 7, seventh or facial, motor to muscles of expression; 8, eighth or auditory nerve, sensory for hearing (cochlea) and for equilibration (semicircular canals); 9, glosso-pharyngeal, sensory nerve of taste, and motor to some of the muscles of deglutition; 10, pneumogastric, sensory and motor to larynx, lung, heart, and stomach; 11, spinal accessory, motor to muscles of heart (inhibitory) and sterno-mastoid and trapezius; 12, hypoglossal, motor to all the muscles of the tongue; c1, first cervical spinal nerve.

the brain, and also contain a clear fluid—the cerebro-spinal fluid—which removes the products of

brain waste, and at the same time serves, like a water-cushion, to diminish the effect of external shocks. Brain substance is composed of *gray* and *white* matter (with some connective tissue and blood-vessels). The gray matter consists of *nerve cells*, which are minute structures, variously shaped, communicating by numerous fine processes with *nerve fibres*. These cells discharge nerve impulses to, and receive impressions from nerve fibres. The white matter is composed nearly entirely of white medullated nerve fibres, whose function is to transmit nerve impulses from one point to another. The relations of the gray and white matter vary greatly in the different parts of the brain. The main divisions of the brain are the *cerebrum* (great brain or cerebral hemispheres), the *cerebellum* (with the *pons Varolii*), the *optic lobes* (*corpora quadrigemina*, with the *crura cerebri*), and the *medulla oblongata*. An examination of figs. 1, 2, 3, 5, from different aspects of the human brain, will convey an idea of the relative size and position of these parts. The cerebrum underlies the whole vault of the cranium, and covers all the rest of the brain when seen from above (fig. 1). Below its posterior extremity, and separated from it by a fold of dura-mater, is the cerebellum. Below the cerebellum, again, lies the medulla oblongata, which is continuous, through an opening in the base of the skull called the foramen magnum, with the

fissure, at the bottom of which lies a great transverse commissure, the *corpus callosum*. The hemispheres are covered with a thin layer of gray matter (or nerve cells), and thrown into ridges and furrows (technically called convolutions or gyri, and fissures). These seem (fig. 1) to be arranged without any definite order, but Gratiolet, by comparing the simpler brains of monkeys and of the human embryo, discovered that certain fissures ('primary' fissures) were

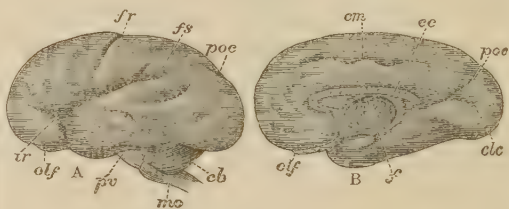


Fig. 4.—Lateral (A) and median (B) surface of the Brain of the Human Embryo, to show the simple Convolutions and the primary Fissures (Mihalkovics):

fs, fissure of Sylvius; *fr*, fissure of Rolando; *poc*, parieto-occipital fissure; *clc*, calcarine fissure; *cm*, callosal-marginal fissure; *ir*, island of Reil (not visible from the surface in the adult); *olf*, olfactory lobe; *f*, fornix; *pv*, pons Varolii; *mo*, medulla oblongata; *cb*, cerebellum.

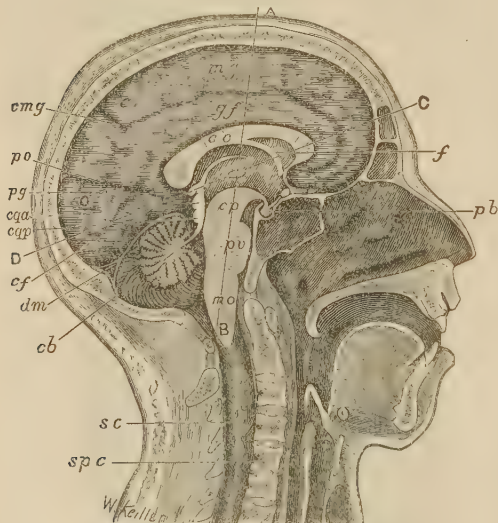


Fig. 3.—Median Longitudinal Section through Head and upper part of Neck, to show relation of Brain to Cranium and the Spinal Cord (Original drawing from preparation in Anatomy Rooms at Surgeons' Hall, Edinburgh):

c, cerebrum; *cb*, cerebellum; *sc*, spinal cord; *spc*, spinal column; *mo*, medulla oblongata passing, through foramen magnum, into the spinal cord; *pv*, pons Varolii; *cp*, cerebral peduncles, or *crura cerebri*; *cga*, anterior corpora quadrigemina; *cqp*, posterior corpora quadrigemina; *pg*, pineal gland; *pb*, pituitary body; *cc*, corpus callosum, divided transversely; *f*, fornix; *mg*, marginal gyrus; *gf*, gyrus fornicatus; *cmg*, callosal-marginal sulcus; *o*, occipital lobe; *po*, parieto-occipital fissure; *cf*, calcarine fissure; *dm*, dura-mater, separating cerebrum from cerebellum. The lines AB and CD show the position of the sections in figs. 6 and 7 respectively.

Spinal Cord (q.v.). The medulla passes directly upwards into the protuberance called the pons Varolii, which is connected by the crura cerebri or cerebral peduncles with the cerebrum. Behind the crura cerebri, in the angle between the cerebrum and cerebellum, lie the optic lobes (*corpora quadrigemina*). The cerebrum consists of two nearly equal *hemispheres*, divided by a deep median

always present. There are, on the outer surface, the *fissure of Sylvius* (*fs*), the *fissure of Rolando* (*fr*), and, on the inner surface, the *parieto-occipital* (*po*). These fissures form the boundaries of the various lobes of the cerebrum. (1) The *frontal lobe* (FL) is that part of the outer surface, and the corresponding part of the median surface, which lies anterior to the fissure of Rolando. (2) The *temporo-sphenoidal lobe* (TL) lies below the fissure of Sylvius. (3) The *occipital lobe* lies behind the parieto-occipital fissure, and includes the corresponding parts on the outer surface. (4) The *parietal lobe* is bounded by the fissures of Rolando and of Sylvius, and by the occipital lobe. (5) The *island of Reil* lies at the bottom of the fissure of Sylvius (*ir*, fig. 4), and is obscured in the adult by the adjacent lobes. Secondary fissures on these lobes divide them into *convolutions*. Thus (fig. 5), on the frontal lobe, we have the first (*F₁*), second (*F₂*), third (*F₃*), and ascending (*af*) frontal convolutions; on the temporo-sphenoidal, the first (*T₁*), second (*T₂*), and third (*T₃*) temporal convolutions; on the parietal, the ascending (*ap*), postero-parietal (*pp*), angular (*13'*), and supra-marginal (*13*) convolutions. On the median surface (fig. 3) we have the *marginal convolution*, the *gyrus fornicatus* (*gf*) immediately above the corpus callosum, and the *gyrus hippocampi*, &c. On the under surface of the cerebrum we see the two olfactory lobes (nose-brain) (1) and the two optic nerves (2). The latter, crossing like the letter X, wind round the two cerebral peduncles (*cp*), to terminate in the optic thalami and optic lobes. These peduncles are seen passing from the under surface of the hemispheres, and approaching each other as they enter the pons Varolii. If we press apart the two cerebral hemispheres, we come upon the corpus callosum (*cc*, fig. 3). This is a band of white fibres that probably connects corresponding convolutions of both hemispheres. On dividing this and removing some white fibres (the fornix, fig. 3, *f*), and a layer of connective tissue (*velum interpositum*), with its vascular margin (the choroid plexus), we expose the *ventricles* of the cerebrum—viz. the two lateral and the third ventricles. The former occupy the hemispheres, the latter lies between them, and is continued backwards through a narrow channel (the *aqueduct of Sylvius*) into the fourth ventricle,

which lies behind the pons Varolii and medulla (figs. 6, 7, 8). Projecting into the third and lateral ventricles are rounded masses of gray matter, the *corpus striatum* and *optic thalamus*, often called the *basal ganglia* (figs. 6, 7). A better idea of the



Fig. 5.—Outer aspect of Brain, showing relation to the bones of the Skull, and the position of Ferrier's areas (Landois):

fr, fissure of Rolando; *fs*, fissure of Sylvius; *po*, parieto-occipital fissure; *F1* superior, *F2* middle, *F3* inferior frontal; *af*, ascending frontal convolution; *ap*, ascending parietal; *pp*, postero-parietal convolution; *T1* superior, *T2* middle, *T3* inferior temporo-sphenoidal convolution; *O*, occipital lobe; *cb*, cerebellum; 1 (postero-parietal convolution), advance of the opposite leg, as in walking; 2, 3, 4 (round upper extremity of fissure of Rolando), complex movements of opposite leg, arm, and of the trunk, as in swimming; 5, 6, 7 (ascending parietal convolution), individual and combined movements of the fingers and wrist of the opposite hand, or prehensile movements; 8 (posterior end of superior frontal convolution), forward extension of opposite arm and hand; 9 (upper part of ascending frontal convolution), supination and flexion of opposite forearm; 10 (median part of ascending frontal convolution), retraction and elevation of opposite angle of the mouth; 11 (lower part of ascending frontal convolution), elevation of ala nasi, and upper lip, with depression of lower lip; 12 and 13, opening of mouth with protrusion and retraction of tongue—on the left side is aphasic region; 14, between 10 and lower end of ascending parietal convolution, retraction of opposite angle of the mouth, the head turns slightly to one side; 15, posterior part of the superior and middle frontal convolutions (eyes open widely, pupils dilate, head and eyes turn towards opposite side); 16, 17 (supra-marginal and angular gyrus), eyes move towards opposite side, or upwards and downwards (centre for vision); 18, superior temporo-sphenoidal convolution (centre for hearing).

relation of all these parts will be gained by studying the two transverse sections (figs. 6 and 7) made in the direction of the dotted lines AB and CD in fig. 3. Surrounding the whole cerebrum is the thin convoluted envelope of gray matter, about a quarter inch thick. Within this lies the *centrum ovale* composed of white fibres. Connecting the two hemispheres is the corpus callosum (*cc*) with, underneath it, the *septa lucida* and *fornix* (fig. 7). Projecting into the ventricles are the ovoid optic thalamus and the caudate nucleus (*cn*) of the *corpus striatum*. A wedge-shaped mass of gray matter (*ln*), the *lenticular nucleus* of the *corpus striatum*, is separated from the first two nuclei by a band of white fibres, the *internal capsule* (*ic*), which in fig. 6 we see to be composed of two parts, an anterior limb and a posterior limb, which meet each other at an obtuse angle (the knee). Immediately outside the lenticular nucleus is the white *external capsule* (*ec*), separated by a thin band of gray matter, the *claustrum*, from the island of Reil (*ir*). The *centrum ovale* consists of nerve fibres passing in various directions, very difficult to unravel from each other. Certain of

them pass between adjacent convolutions, others again connect parts at a distance, such as the frontal and occipital lobes, many cross by the corpus callosum to end probably in corresponding convolutions of the opposite hemisphere. Others connect the basal ganglia with the cortical gray matter. From the internal capsule an important group, known as the *corona radiata* (see fig. 7), passes to the whole of the cortex. That part of the corona radiata entering the occipital lobes is called the optic radiation of Gratiolet, who considered it to be the central expansion of the optic nerve (*or*, fig. 6).

The *optic lobes* consist of two (anterior and posterior) pairs of rounded eminences of gray matter (figs. 3 and 8) situated close to the optic thalami, and underlying the pineal gland. They are very intimately connected with the optic nerves, part of these ending in the anterior pair; and also to the third and fourth nerves, whose nuclei of origin lie just underneath them in front of the aqueduct of Sylvius (3', fig. 8). The *crura cerebri* are formed of fibres passing down from the cerebrum to the pons, medulla, and cord (see fig. 3), and of others passing up from the medulla and cord, and from the cerebellum (superior peduncles) to the cerebrum.

The *cerebellum* possesses a median and two lateral hemispheres which have been subdivided into lobes (figs. 2 and 3). Its parts are arranged in thin laminae or folia with deep intervening fissures.

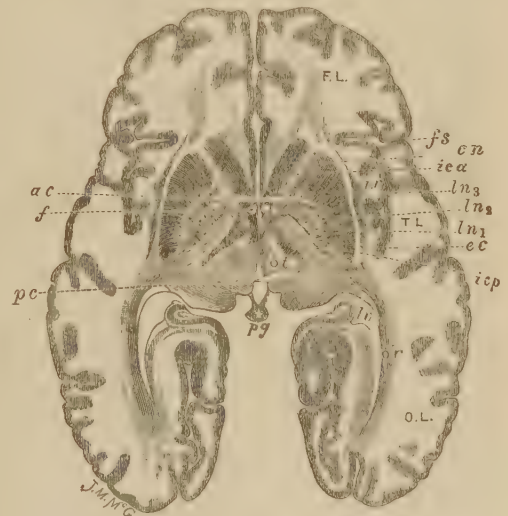


Fig. 6.—Transverse Section of Cerebrum in plane of line CD (fig. 3) (Original drawing):

F.L., frontal; T.L., temporal; O.L., occipital lobes; *fs*, fissure of Sylvius; *ir*, island of Reil; *cn*, caudate nucleus; *ln1*, *ln2*, *ln3*, the three divisions of the lenticular nucleus; *ica*, anterior limb of internal capsule; *icp*, posterior limb of internal capsule (the anterior part conveys motor, the posterior sensory fibres), the part generally injured in cerebral hemorrhage; *ot*, optic thalamus; *or*, optic radiation, probably conveys sensory fibres to occipital and temporal lobes; *ac*, anterior commissure, connects both temporal lobes; *f*, fornix; *pc*, posterior commissure; *pg*, pineal gland; *lv*, lateral ventricle (posterior horn).

These laminae have a central core of white matter with a thin covering of gray matter. Sections through them recall the appearance of a tree and its branches (hence the term *arbor vitae*). The cerebellum has three pairs of *peduncles* (fig. 8)—(*a*) superior, which pass upwards and across the middle line towards the opposite cerebral hemisphere, but ending under the optic lobes; (*b*) middle, which form the main part of the pons Varolii, and which enter indirectly into connection with fibres from

the opposite cerebral hemisphere; (*c*) inferior (the *restiform body*), which is connected with the medulla and Spinal Cord (q.v.). There is also an intimate connection by the auditory nerve with the semicircular canals of the ear.

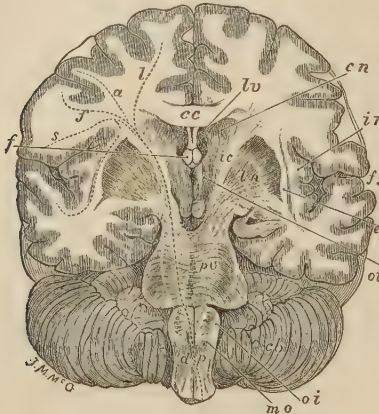


Fig. 7.—Vertical transverse Section of Brain in direction of line AB (fig. 3) (Original drawing):

The shaded outline of the cerebrum indicates the superficial gray matter.

fs, fissure of Sylvius; *ir*, island of Reil, a convolution at the bottom of the fissure of Sylvius concealed in the adult; *cc*, corpus callosum, the transverse interhemispherical commissure; *lv*, lateral ventricle; *f*, fornix, divided transversely. Between the fornix and the corpus callosum are seen the thin septa lucida; *cn*, caudate nucleus; *ln*, lenticular nucleus (with its three divisions); *ot*, optic thalamus; *ic*, internal capsule; *ec*, external capsule, and outside it a layer of gray matter, the claustrum; *pv*, pons Varolii; *mo*, medulla oblongata; *oi*, inferior olivary body; *cb*, cerebellum; *l*, *a*, *f*, *s*, mark the origin of the dotted lines representing motor fibres passing from the leg, arm, face, and speech 'centres,' through the internal capsule, cerebral peduncles, pons Varolii, medulla oblongata, and crossing at *dp*, the decussation of the pyramids to the opposite side of the spinal cord (to explain crossed paralysis). Another dotted line passes from *s* (speech centre) to hearing centre in first temporal convolution.

The *Medulla Oblongata* is the lowest division of the brain. It has a somewhat conical form, with the base towards the pons Varolii, the narrow end towards the spinal cord. On the under surface, on each side of the middle line, are the *anterior pyramids* decussating with (crossing) each other where the medulla passes into the spinal cord. External to them is an ovoid projection, the *olivary body* (fig. 2). On the dorsal aspect is the lozenge-shaped fourth ventricle, which is bounded below by the two inferior and above by the superior peduncles of the cerebellum. All the cranial nerves below the fourth originate from the floor of the medulla in the positions marked by the numbers on the right side of fig. 8. Their points of emergence on the under surface are indicated in fig. 2.

SIZE OF BRAIN.—The brain of the male has an average weight of 49½ ounces, that of the female is about 5 ounces lighter. Cuvier's brain weighed 1861 grammes (1 gramme is 15½ grains), Turgenieff's 2012 grammes. On the other hand, Virchow has found a brain weighing 1911 grammes in a man without any specially high mental development, and the brains of some very able men have been found below the average weight. Too much stress has been laid upon the connection of mental capacity with brain weight in individual instances. Still the general fact is that the most highly developed races have the heaviest brains.

FUNCTIONS OF THE CEREBRUM.—If we remove the cerebral lobes from an animal, we deprive it of

its volition and its intelligence. We may leave it capable of performing very complex movements, almost, if not quite, as perfectly as before; but we have destroyed its power to initiate these movements, we reduce it to the condition of a responsive machine. Thus a frog without its cerebrum will, if undisturbed, remain motionless for an indefinite time. If it be placed on a board, and the board tilted, it will change its position till its equilibrium is stable, and then it becomes motionless. If put into water, it will swim, and if a piece of wood be put before it, it will climb up on it, and there remain; if it be pinched, it will spring and will avoid any obstacle placed in its way, just as an entire frog would. A pigeon similarly treated becomes drowsy and stupid. If food be placed before it, it will not take it; it exhibits no sign of terror at what would otherwise cause it alarm, further than to start slightly at a loud sound, or a bright light. But if thrown into the air, it will fly to a convenient resting-place; if placed on its back, it will regain its feet, and thereafter become drowsy again.

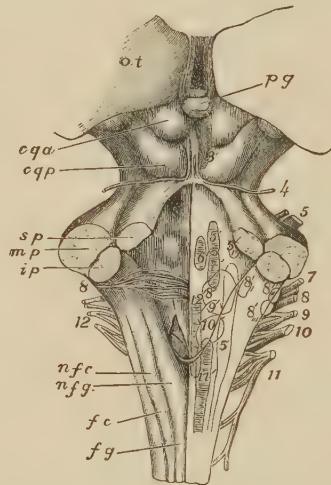


Fig. 8.—Medulla Oblongata with Corpora Quadrigemina seen from behind (Cerebellum cut away) (Landois):

ot, optic thalamus; *pg*, pineal gland; *cqa*, anterior corpora quadrigemina; *cqp*, posterior corpora quadrigemina; *sp*, superior cerebellar peduncle; *mp*, middle cerebellar peduncle, goes to pons Varolii; *ip*, inferior peduncle, or restiform body, goes to medulla oblongata and spinal cord; *fg*, funiculus gracilis, or column of Goll; *nfg*, nucleus of the funiculus gracilis; *fc*, funiculus cuneatus, or column of Burdach; *nfc*, nucleus of the funiculus cuneatus. The lozenge-shaped area in the centre of the figure is the fourth ventricle. The numbers 4-12 indicate the superficial roots of the corresponding cranial nerves. The numbers 3'-12', their nuclei of origin.

Similar experiments on other animals show similar results. In man we find that imperfect development of the cerebrum is accompanied by imbecility and idiocy, and that the races that have the heaviest cerebra and the most fully developed convolutions are the most intelligent. Among animals, again, the degree of intelligence increases with the increase in size of the cerebrum relatively to the other parts of the brain.

Flourens, the great French physiologist, held that the *whole* of the cerebrum was employed in *every* mental process. He removed parts of the hemispheres of pigeons, and came to the conclusion that *all* the mental functions became enfeebled, and that to an equal degree, in proportion to the amount of brain matter removed, no matter from what part of the cerebrum it were; and that as long as any part of the gray matter remained, so

long could mental functions be carried on. This doctrine long held the field. It seemed to explain why large masses of brain substance could be removed by injury without apparent effect on the mind, and why there was no constant relation between symptoms and locality of brain lesions. But it did not explain all the facts. The condition of *Aphasia* (q.v.), or loss of articulate speech, was found to be almost constantly associated with a certain convulsion, and certain paralysis and limited convulsive phenomena were found by Hughlings Jackson to be apparently due to definitely localised lesions. In 1870 Fritsch and Hitzig, two German observers, discovered that when certain areas of the cerebral cortex were stimulated by the galvanic current, movements of the opposite side of the body were produced. This discovery put the question of cerebral localisation on a new footing. Ferrier repeated and extended their results, and soon succeeded in mapping on the brains of animals (rabbits, dogs, and monkeys), areas, stimulation of which by the faradic current produced movements which corresponded to the area as accurately as the notes correspond to the keys of a pianoforte. A great controversy immediately arose as to the meaning and value of these discoveries, the result of which has been to substantiate their accuracy, and to lead to their extension. Ferrier's 'motor areas' (see fig. 5) lie on either side of the fissure of Rolando, and extend into the postero-parietal and part of the first, second, and third frontal convolutions. The lower part of the area corresponds to the movements of the face and tongue; the intermediate parts to those of the arm; the upper to those of the leg. A centre for the muscles of the trunk, arm, and leg has been found on the marginal convulsion (on the median aspect of the parietal lobe); and Ferrier's areas have been further subdivided, so that centres for such fine movements as, e.g., the apposition of the forefinger to the thumb have been mapped out on the brain of the monkey by Horsley, Schäfer, and others. A knowledge of the correspondence between the convolutions of the simian and the human brain, and of the relation of the convolutions of the latter to the bones of the skull (see fig. 5), has already led to the successful removal of tumours whose seat was indicated by definite motor disturbances. When these areas are destroyed by disease, the power of the corresponding voluntary movement or movements is lost. When they are irritated, corresponding spasms of movement are set up (Jacksonian epilepsy). The motor area is now known to be situated in front of the fissure of Rolando only.

Aphasia.—The left hemisphere controls the right side of the body, and as we are mostly *right-handed*, so we are *left-brained*. When the posterior end of the third frontal convulsion on the left side is destroyed, *aphasia* results. An aphasic person understands what is said to him, but has lost the power of articulate speech—the words wanted are either forgotten or cannot be uttered, and this although the muscles of articulation are unimpaired. They cannot be co-ordinated. In *left-handed* individuals *aphasia* has been found associated with the corresponding lesion on the right side of the cerebrum. The third left frontal convulsion is said to be well developed in the brains of remarkable men, and to be very simple in deaf-mutes, and quite rudimentary in idiots. The corresponding condition of *agraphia*, or inability to express one's self intelligently by writing, has been recently found associated with lesions of the posterior end of the second frontal convulsion.

Aphasia may be divided into two components, the motor and the sensory. Speech is the response to things heard or things seen. In the auditory

and visual areas on one side there is an area for words heard and for words seen. Injury of either of these areas produces *word-deafness* or *word-blindness*. In the former case the injured person is unable to speak in response to conversation because he has lost the power of understanding spoken words; in the latter case he cannot reply to anything written. Disease of Broca's area produces *anarthria*, or paralysis of articulation, as it is in this area that the motor centres for these muscles are situated; but in front of this area is a small psychomotor area which arranges the thoughts which the motor area then gives expression to, and if this be destroyed the patient loses the power even to form anything to say.

Cortical Sensory Areas.—The determination of the existence of definite areas for the conscious perception of the different forms of sensory impressions is much more difficult than that of the motor areas, and physiologists are yet far from being agreed on many points.

Centre for Sight.—Munk places this centre in the occipital lobe; destruction of one lobe produces permanent blindness in one side of both eyes (what is called homonymous hemianopsia). Histological examination of the visual area in the occipital lobe shows that it may be divided into two portions, termed the *visuo-sensory* and the *visuo-psychic*. The visuo-sensory portion receives the stimuli from the eye, and passes them on to the visuo-psychic part where they are stored up. A fresh stimulus reaching the visuo-sensory area can then be compared with the previous stimuli stored up in the visuo-psychic portion. In man, disease of the *left angular gyrus* produces what is called *word-blindness*. In this condition one loses the power of reading words, although one sees the characters distinctly, and may even be able to spell the word. One may even retain the power of writing spontaneously or from dictation, and yet be unable to read what has been written. It may be compared to the condition where one has completely forgotten a foreign language; one can write or read the words, but has absolutely lost their meaning. Recent investigation seems to show that the occipital lobes alone are the centre for sight, each lobe being connected with the corresponding lateral halves of the two eyes.

Centre for Hearing.—This seems to lie in the first temporo-sphenoidal convulsion in both sides. In man, partial destruction of this convulsion on the left side causes the condition of *word-deafness* (where one hears the sounds, but has absolutely lost their meaning).

Centres for Taste and Smell.—Ferrier locates the former of these in the uncinate gyrus (on the inner surface of the temporo-sphenoidal lobe).

Centres for Touch (common sensibility).—These lie in the post-central gyrus immediately behind the fissure of Rolando, the sensory area for each limb lying behind the corresponding motor area. Injury produces a symptom termed *astereognosis*, an inability to recognise by touch objects placed in the opposite hand. Its function is the (a) recognition of spacial relations, (b) graduated response to stimuli of different intensity, and (c) appreciation of similarity and difference in external objects brought in contact with the surface of the body. A prick is felt, as far as the painful element is concerned, by the optic thalamus, while the pointedness, clearness, and sharpness are the results of cortical activity.

Frontal Lobes.—No definite result follows from the experiments made on the anterior part of the frontal lobes; but it is probable that they are associated with the exercise of the higher mental faculties. They are well developed in highly intelligent individuals, and *vice versa*. The frontal lobes contain the motor and psychomotor areas.

The cerebrum may be regarded as divided into two portions by the fissure of Rolando. The anterior part is motor, the posterior part sensory. The sensory portion receives sensory stimuli in the appropriate sensory area, and interprets them by means of the corresponding psychic area. These stimuli are then brought into association with each other by the process of cerebral association which is carried out by the great silent areas of the brain lying between these areas, and known as the areas of cerebral association. When all these receptive impulses have undergone association, they pass to the frontal area, where they are utilised for expression. The motor area does not appear to be able to originate any motor stimulus; this is done by the psychomotor area, which, after it has arranged what the motor response is to be, touches off, as it were, the proper motor centre. It is thought that the prefrontal area has the highest function of all, as it appears to be able to exercise selective or voluntary associative functions.

Basal Ganglia—Corpus striatum.—The corpus striatum appears to act as the motor centre in lower vertebrates. In man, however, it is not excitable, is independent of the cerebral cortex, is not able to take over the function of the cortex if this be destroyed, and is not directly connected with the spinal cord. It is found, however, that when it is diseased involuntary movements take place. These are of two kinds, (1) fine tremors as in paralysis agitans, and (2) coarse movements as in chorea and athetosis. From this it is thought that the corpus striatum has a connection both with the cerebral cortex and with the spinal cord, and that its function is to steady the impulses passing from the cortical motor area by means of the pyramidal or cortico-spinal tracts to the spinal cord and on to the muscles. These voluntary impulses appear to require steadying, and if the steadying influence of the corpus striatum be removed involuntary movements occur, coarse in character if the cortical connection be damaged, and fine tremors if the connection with the spinal cord be injured.

Optic Thalamus.—This is the sensory end-station of lower vertebrates. In man, injury to the optic thalamus is followed by loss of sensation on the opposite side of the body. There is, however, a further end-station in man, namely, the post-central gyrus of the cerebral cortex. We now know that the optic thalamus is the centre for the affective aspect of sensation, and is associated with the crude recognition of touch, pain, heat, and cold.

Cerebellum.—Flourens considered that the function of the cerebellum was to co-ordinate voluntary movements. He found that removal of superficial layers in a pigeon caused slight weakness and disharmony of movement; that further removal caused general agitation, and finally loss of ability to stand or fly or walk. It could not rise when placed on its back. But it was not paralysed, it made continual ineffectual struggles to recover its position, and only ceased when completely exhausted. There was no loss of volition or intelligence. It could see and hear and feel quite well. Disease of the human cerebellum, however, when it causes symptoms, does not cause general inco-ordination, but merely a staggering gait like that of intoxication, and a feeling of giddiness. Ferrier holds that it is the centre for co-ordinating movements necessary for the equilibrium of the body, and that its different parts control different sets of these movements. For instance, destruction of the anterior part of the median lobe causes tendency to fall forwards, loss of its posterior part causes tendency to fall backwards, and of one lateral lobe a tendency to rotate towards the side injured. Stimulation of any one of these parts causes movements of the head, eyes, and limbs, such as would

counteract the disturbance of equilibrium produced by the destruction of the part. The anatomical connections of the cerebellum, with the semicircular canals of the ear, seem to point to the same conclusion. In birds, where muscular co-ordination is so essential for flight, the cerebellum is large. The cerebellum is related to the opposite side of the cerebrum, but to the same side of the body.

The *Medulla Oblongata* is the great seat of the centres for the functions of organic life, as may be understood from the fact that it gives origin to all the cranial nerves, except the first four pairs (see fig. 8). The various centres are: (1) The centre for respiratory movements, near the lower extremity of the fourth ventricle; (2) for the inhibition (or restraint), and for the acceleration of the movements of the heart; (3) for the control of the blood pressure (vaso-motor centre), including the 'diabetic' centre, which is simply the vaso-motor centre for the liver; (4) centre for swallowing; (5) centre for movements of the gullet and stomach, and the vomiting centre; (6) for movements of articulate speech; (7) for the secretion of the saliva. The term 'centre' involves the following mechanism: (1) A sensitive end-organ or surface; (2) an afferent nerve going to (3) a nerve cell, or group of nerve cells, from which passes (4) an efferent nerve fibre to (5) a muscle. That the action of the 'centre' be possible all the links in the chain must be intact.

DISEASES OF THE BRAIN.—**Abscess.**—Abscess of the brain is a collection of pus in its substance. The most common causes are compound fractures of the skull, diseases of the middle ear and temporal bone, and pyæmia. Many cases develop quietly, others are preceded by headache, pain, vomiting, delirium. When pus has formed, the symptoms will depend on the site; usually there is more or less paralysis of motion. Finally the signs of compression precede the fatal termination. When an abscess in the brain has formed, if its situation can be made out, the pus should be evacuated by Trephining (q.v.). Many cases have recently been treated successfully in this way.

Anæmia of the brain is a deficiency in the quality or in the quantity of blood in the brain. It may result from direct loss of blood, exhausting diseases, weakness of the heart, or from the pressure of growths or fluids within the skull. Headache, drowsiness, hyperæsthesia, giddiness, muscular weakness are generally present, and most marked in the erect position. Syncope, or fainting, may result from the too rapid assumption of the erect position. In anæmia from acute loss of blood, and in syncope, the head must be kept low, and stimulants applied to the skin, and, if possible, administered internally. In chronic anæmia, the cause must be removed, stimulating nourishment given at frequent intervals, and iron administered.

Atrophy of the brain is a wasting of its substance, and is either congenital, or a condition accompanying old age, or resulting from exhausting disease, and very frequently from alcoholic excesses. The congenital form produces imbecility or idiocy. The acquired form leads to loss of memory and of mental power, and generally to diminution of muscular power.

Compression, concussion, and contusion of the brain are three terms often popularly confounded with each other. Compression means the squeezing of the brain by any fluid such as blood, serum, or inflammatory exudation or tumour. Concussion is the result of shock to the brain from an injury, but without visible effect on its substance. In contusion the brain substance is more or less lacerated. In compression there is paralysis, insensibility, coma gradually deepening, dilated pupils, and

generally a slow pulse. In concussion there is first a period of collapse, with pallor of face, feebleness of pulse, and cold extremities. If this is recovered from, consciousness gradually returns with vomiting, fever, and a more or less sleepy condition. Perfect quiet, and the avoidance of all stimulation, must be observed till convalescence is complete.

Congestion of the brain causes headache, giddiness, mental excitement, and sleeplessness. If long continued, a period of depression follows with drowsiness, mental and physical weakness. Some attacks are so acute as to produce delirium, or convulsions, or even symptoms of apoplexy, which may be fatal. Among the causes of acute congestion may be noted excessive mental strain, the use of alcohol in excess, and some of the acute fevers. It is of frequent occurrence in certain diseases of the nervous system.

Inflammation of the brain substance is usually the result of injury or disease of the bones of the skull, and is accompanied with more or less meningitis.

Hemorrhage into the brain leads to Apoplexy (q.v.). It is probably always preceded by disease of the blood-vessels, more especially with chronic Bright's disease and alcoholism. The vessels which rupture are most commonly the small arteries which pass through the basal ganglia. The onset may be quite sudden, or there may be premonitory symptoms such as headache, giddiness, or numbness in the limbs, &c.

Meningitis, Hydrocephalus (or water in the head), *Epilepsy, Aphasia*, are all forms of brain disease, but are treated as separate articles.

Brain Fever is a popular term which includes congestion of the brain and its membranes, delirium tremens, and inflammation of the brain substance itself. It ought to be discontinued altogether.

Softening is a term popularly and very erroneously used to indicate failure of mental power and general feebleness, often accompanied with drowsiness, dullness, loss of memory, and with emotional excitability. There may be no actual softening in such a condition—merely atrophy of the brain.

True softening is the result either of clotting of blood in the vessels, disease of the walls of the arteries (atheroma), or Embolism (q.v.), or the presence of tumours. The brain substance becomes red, or yellow, or white, and the fibres break up as oil drops, and are gradually absorbed, a cyst containing fluid being left. The symptoms will depend on the part affected; if in the motor area, there will be paralysis of motion; or in the sensory area, loss of the corresponding power of conscious perception.

Tumours may grow from the membranes, the blood-vessels, or the connective tissue of the brain. They vary greatly in structure, many being allied to the sarcomata. The symptoms vary greatly according to their position, or may be absent entirely. The most common symptoms are intolerable headache, vomiting (without sickness), giddiness, convulsions, paralysis, and a condition of the optic nerve and retina recognisable by the ophthalmoscope, called optic neuritis. Some tumours can be removed by medical treatment, a few by surgical means. Generally all that can be done is to relieve pain and support the strength.

See also APHASIA, APOPLEXY, CEREBRO-SPINAL FLUID, CONCUSSION, CONSCIOUSNESS, EPILEPSY, HYDROCEPHALUS, INSANITY, MENINGITIS, NERVOUS DISEASES, NERVOUS SYSTEM, PARALYSIS, SHOCK, SOMNAMBULISM, STROKE, &c.; Bolton, *The Brain, in Health and Disease* (1914); Campbell, *The Localisation of Cerebral Function* (1905); Villiger, *Brain and Spinal Cord* (1912); Schäfer, *Text-book of Physiology* (1898); André-Thomas and Durupt, *Localisations Cérébelleuses*, (1914), &c.

Brain-coral. See MEANDRINA.

Brainerd, a city of Minnesota, on the Mississippi, has foundries, railway works, and miscellaneous manufactures; pop. 10,000.

Brainerd, DAVID (1718-47), missionary from 1742 to the American Indians, was born at Hadam, Conn., studied three years in Yale College, and died at Northampton, Mass., in the house of Jonathan Edwards. See Life by latter (1749).

Braintree, a town of Massachusetts, 10 miles S. of Boston, manufactures shoes, &c.; pop. 10,000.

Brakelonde. See JOCELIN.

Brakes. Any contrivance for controlling by friction the speed of carriages, wagons, trains, or revolving drums is called a brake. In its simplest form, as applied to horse-drawn road vehicles, wooden blocks are pressed by the driver through the medium of connecting rods or levers against the tires of the wheels; the friction thus set up checks the speed, enabling the vehicle to go down inclines at a steady speed or to be rapidly pulled up; in the case of cranes and similar machines a flexible strap or band is tightened on a rotating pulley or drum.

Brakes find their most important application on railway trains. Stephenson devised a steam-operated brake for his locomotives, but it was not a success. Since his day much work has been done by engineers in designing various types of power brakes for railway work, mainly with the object of making them continuous and automatic. Briefly the conditions which a train brake should fulfil are these: It must be continuous—that is, connected throughout the train; automatic—that is, in case of accident, such as the breaking apart of the train, it must instantaneously put itself on; be equally readily put on or off any vehicle, and be simple in construction and durable. Moreover, it should allow of vehicles being slipped or detached without putting it on, should be tell-tale to indicate if it is in working order, be constantly in use, and, lastly, very powerful, capable of stopping a heavy train at a high speed in a few hundred yards.

The two chief types of continuous automatic train brakes now in use are the Westinghouse and the Vacuum. The first pressure brake, patented in 1869 by Mr Westinghouse of Pittsburg, U.S.A., was of the non-automatic type, but it did not prove a success, chiefly owing to the fact that it was not operative on detached coaches when a train broke apart, and also owing to the time before the brake-blocks came into operation on the rear coaches of long trains; it was therefore superseded later by the ordinary automatic pressure air brake. In this brake compressed air at from 70 to 80 lb. per square inch is stored in a reservoir under each vehicle and in a pipe connecting them; also under each vehicle is a brake-cylinder the piston of which through rods operates the brake-levers; and, lastly, a complex connecting valve known as the 'triple valve.' As long as pressure is maintained in the train-pipe the brake is off, but if the air escapes intentionally or otherwise from the train-pipe the brakes are put on. The triple valve is an ingenious piece of mechanism. A piston with a sliding valve attached to its top works in a small case with connections to the train-pipe, brake-cylinder, and air-reservoir. If there is air pressure in the train-pipe it acts on the under side of the small piston, keeping it and its valve in such a position that the brake-cylinder is in communication with the air (the brakes are therefore off), while compressed air can feed freely into the reservoir; but if the pressure in the pipe falls, the excess pressure in the reservoir acts on the top of the piston, forces it and its valve down, thus shutting the passage to the air and allowing compressed air to rush from the reservoir into the brake-cylinder, which causes its piston to

move and put the brakes on. An auxiliary valve in the slide valve gives perfect control over the pressure, and provision is made against accidental leaks of compressed air into the brake-cylinder by means of grooves opening to the air, which are shut when the brakes are put into action. The brake-cylinder may have two pistons (see diagram), kept close together by powerful springs; the compressed air enters between them and forces them apart, thus operating the brake-levers. The hose couplings for the pipes between the carriages are automatic; a valve opens in them when the couplings are made and closes if they are disconnected, except when forcibly torn apart by an accident. To reduce the time for the reduction of air pressure in the train-pipe to reach the rear of the train, in the quick-acting type of brake the triple valve is fitted with a supplementary device which permits, when the air pressure is suddenly lowered, air from the train-pipe to pass directly into the brake-cylinder. This increases both the effective pressure in the brake-cylinders and also the rapidity with which the whole system of brakes comes into action. In 1906 a further change in the mechanism was made in order to produce the quick-action not only for emergency stops, but for ordinary service conditions. The supplementary device explained in the last paragraph was superseded by a small chamber normally full of atmospheric air, which is put into communication with the train-pipe instantly the triple valve begins to operate. Hence, as soon as the driver lowers the pressure in the train-pipe and the triple valve of the first carriage begins to move, the rush of air into its small chamber produces a local further reduction of pressure in the train-pipe which at once reacts on the triple valve of the next vehicle, and so on all along the train, with the result that the brakes on the last vehicle of a train of 1800 feet length are put into action within $2\frac{1}{2}$ seconds after the driver operates his valve.

Automatic vacuum brakes work on the principle of keeping up a vacuum of about 10 lb. below atmospheric pressure in the train-pipe and brake-cylinder under each vehicle, the air being sucked out by ejectors or pumps on the locomotive. The communication between train-pipe and brake-cylinder is controlled by a ball-valve. When the brakes are off there is a vacuum on each side of the piston of the brake-cylinder; when the vacuum is destroyed by the driver or guard letting air into the train-pipe the vacuum on one side of the piston is destroyed, and the piston moves, putting on the brakes through a system of levers; a similar state of affairs is brought about if the train-pipe is forcibly ruptured by any accident. There are various special devices, similar to those in the Westinghouse brake, for bringing all the brakes on the train into action as nearly simultaneously as possible.

A valuable set of experiments was made by Sir Douglas Galton on the Brighton and South Coast Railway in 1878 (see *Proc. Inst. Mech. Eng.* 1878, 1879), which proved, amongst other things, that the pressure between wheel-tires and brake-blocks should not be so great as to cause the wheels to skid, and that the coefficient of friction between shoe and tire increased as the speed of the train was decreased. Another valuable series of experiments was that made by the American Motor-car Builders Association in Iowa in 1886-87.

The word brake is also used to indicate any form of engine dynamometer which measures the power

given out by any engine or electric motor by absorbing it in overcoming friction; the simplest method is to hang weights from a strap or rope encircling a pulley or the flywheel of the engine, the other end being attached to a spring balance fastened

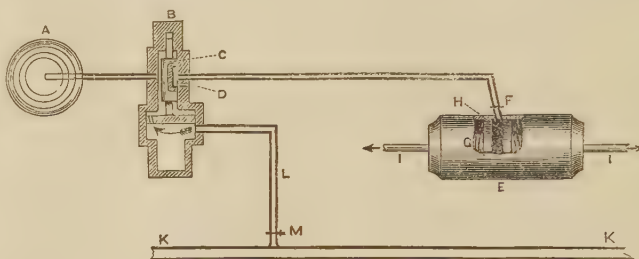


Diagram of Westinghouse Automatic Brake, showing arrangement for one carriage:

A, reservoir; B, triple valve; C, slide valve; D, exhaust; E, brake-cylinder; F, release valve; G, spring; H, pistons; I, J, communication to brake-lever; K, main pipe extending all along the train; L, branch pipe; M, cock.

to the engine base. When the weights so hung are kept in a 'floating' position, the difference between the weights and the pull in the spring-balance measures the horse-power of the engine.

Brama, or **RAY'S BREAM** (*Brama rasi*), a bony fish closely related to the Coryphænas or 'dolphins,' and therefore belonging or nearly allied to the mackerel family. In this genus the body is laterally compressed and more or less deep, the spinous portion of the long dorsal fin is not well developed, and the tail is deeply forked. Ray's bream is found from the Cape seas northward to the Mediterranean, and even to British coasts. Its total length may be as much as 2 feet. The flesh is said to be very good.

Bramah, **JOSEPH**, inventor, was born at Stainbrough, near Barnsley, Yorkshire, April 13, 1748. A farmer's son, he was incapacitated in his sixteenth year for agricultural labours by an accidental lameness, so was apprenticed to the village carpenter, and afterwards obtained employment with a London cabinetmaker. Subsequently, he established himself in business in the metropolis, and became distinguished for the number, value, and ingenuity of his mechanical inventions, such as safety-locks, and improvements in water-closets (his first patent, 1778), which have continued in use till the present time; in pumps and fire-engines, in the construction of boilers for steam-engines, in the processes of making paper, in the construction of main-pipes, wheel-carriages, the beer-machine used at the bar of public-houses, and many others. In the year 1796 he patented the hydrostatic press known by his name, which ranks as his most important contribution to mechanical science (see **HYDRAULIC PRESS**). He patented a very ingenious machine for printing bank-notes in 1806, and was one of the first to propose the application of the screw-propeller. In all, he took out eighteen patents. It has been remarked that the germs of all his inventions may be found in the work of others, but that he possessed the genius of improving upon and practically applying the work of previous inventors. He died 9th December 1814.

Bramante, **DONATO**, architect, was born near Urbino in 1444. From 1472 to 1499 he resided in Milan, where he studied geometry and perspective, neither of which sciences was well understood by artists in his day. He was noted as one of the best painters in Lombardy; but his success in architecture eclipsed his fame as a painter. After the fall of Ludovico Sforza, Bramante went to Rome,

where he was first employed by Pope Alexander VI., and afterwards by Julius II. The first great work which he undertook for the latter was to connect the Vatican palace with the two pavilions of the Belvedere by a series of immense galleries; the second was the rebuilding of St Peter's Church, of which he laid the new foundation in 1506. When only a small portion of his plans had been realised, Bramante died at Rome, 11th March 1514, and succeeding architects departed widely from the original design of a grand cupola over a Greek cross. Among other works of Bramante in Rome may be mentioned the Cancellaria and Torlonia palaces, in which he adhered more strictly than in other works to antique forms, but not without a characteristic grace in his application of these.

Brambanan, a district of the province of Surakarta, Java, rich in remains of Hindu temples, of which there are six groups, with two apparently monastic buildings. The edifices are composed entirely of hewn stone, and no mortar has been used in their construction. The largest is a cruciform temple, surrounded by five concentric squares, formed by rows of detached cells or shrines, embracing an area of 500 feet square. In several of these *dagobas* the cross-legged figures of Buddha remain; but the larger figures which must have occupied the central temples have disappeared from all but one. The outer one consists of 84 temples; the second, of 76; the third, of 64; the fourth, of 44; and the inner one, of 28. In the centre stands the largest and most imposing structure of all. It is 90 feet high, and profusely decorated with mythological figures, which are executed in a very fair style of art. On the south face of the outside parallelogram there are two monstrous figures, with uplifted clubs, kneeling in a threatening attitude. One of the single Buddhist edifices is pretty entire, as are also about a third of the cells, but the rest lie strewn upon the ground.

Bramble, or **BLACKBERRY** (*Rubus fruticosus*), a plant common in Britain and most parts of Europe, having prickly stems, which somewhat resemble those of the Raspberry (q.v.). The flowers do not appear till the summer is considerably advanced, and the fruit ripens towards the



Branch of Common Bramble :
a, a flower ; b, fruit.

end of it, continuing to be produced till the frosts of winter set in. The fruit is too well known to need description. Preserves are prepared from it of very delicate flavour, besides a pleasant and fairly potent wine. The bramble is little cultivated in Britain; but it seems to deserve attention at least as much as the raspberry, and shows great capacity for improvement by cultivation. A slight rail on each side of a row of brambles, to restrain

the straggling stems, affords the necessary security for neatness and order, and the care bestowed is repaid by abundance of fruit, very acceptable where wild brambles are not plentiful, and at a season when there is no other small fruit in the garden. This being one of the most variable of British plants, its systematic arrangement is a matter of great difficulty. New forms seem to spring up by mutation and crossing. Some are very pretty, and reward cultivation on the rock-garden. In America they are extensively cultivated for their fruit; and of late American kinds have been with advantage introduced into Britain. In Scotland the name 'bramble' is applied to the fruit as well as the shrub, and 'blackberry' is by some used for 'black-currant.'—Species of *Rubus* very similar to the common bramble, or varieties of it, abound in the northern parts of Asia, the Himalaya Mountains, and North America. See *RUBUS*.

Brambling, **BRAMBLE FINCH**, or **MOUNTAIN FINCH** (*Fringilla montifringilla*), one of the Finches (q.v.), very like the chaffinch, but slightly larger, and with a more forked tail. In the males, the crown of the head, the cheeks, the back and sides of the neck, and the upper part of the back, are mottled in winter with brown and black; but in spring all these parts have a rich velvety black. The throat and breast are of a rich fawn colour, which is also the prevailing colour of the wings. These are crossed, however, when closed, by an oblique band of jet-black, and by another oblique band of white. The quill-feathers are also black, edged with yellow on their outer webs; the tail-feathers black, edged with reddish white; the rump and the belly are white; a small tuft of feathers under each wing and some of the lower wing-coverts are bright yellow. The female has a reddish-gray head. So far as is known, this finch has no song, but only a monotonous chirp. It is a mere winter visitant in Britain, and even in the south of Sweden it is only a winter bird. It breeds in the more northerly parts of Europe and Asia, and is very widely distributed.

Bramhall, **JOHN**, a great anti-Puritan Irish prelate, was born in 1594, and educated at Sidney-Sussex College, Cambridge. He was already sub-dean of Ripon, and on the road to high preferment when he went to Ireland as Wentworth's chaplain in 1633. He soon became Archdeacon of Meath, and was consecrated Bishop of Derry in 1634. Bramhall's intolerance roused the wrath of the stubborn Scottish settlers in his diocese, and ruined the king's cause in Ulster. When the Civil War broke out, for safety's sake he crossed to England, but the royalist disasters soon drove him to the Continent. At Paris, he argued with Hobbes on necessity and the freedom of the will, but the dogmatic bishop was no match save in his own opinion for that subtlest of sceptics. The Restoration gave him the metropolitan see of Armagh, which he filled till his death in 1663. Bramhall closely imitated Laud in policy, and even resembled him in person, but was far his inferior in intellect. Not strong but merely obstinate in purpose, the so-called Athanasius of Ireland by his impolitic intolerance sealed the doom of Episcopalian supremacy in Ulster. His collected writings have slumbered since their publication in 1677.

Brampton, a very ancient town of Cumberland, 9 miles ENE. of Carlisle by rail. It has a moot-hall, boarding schools, and breweries; there are coal-mines near. Two miles east stands the abbey of Lanercost (q.v.). There is another Brampton close to Chesterfield (q.v.), and several hamlets bear the same name.

Bran is the material obtained from the outer covering or husk of grain during the process of

grinding, and which is separated from the finer flour before the latter is made into Bread (q.v.). It is generally met with in commerce in thin scaly yellowish-brown particles, with sharp edges, and its composition in 100 parts is as follows: Water, 14; fibrin, &c., 15; starch, 44; fat, 4; lignose and cellulose, 17; ash, 6. Bran contains a nitrogenous body called *cerealin*, which is capable of producing, by a process of fermentation, a chemical change in the starch, dextrin, &c. of flour. Bread made of flour containing bran is known as *Brown Bread* (see *BREAD*). The main uses to which bran is put are in the feeding of horses and cattle, and poultry, and in clearing and brightening goods during the processes of Dyeing and Calico-printing (q.v.). In the practice of medicine, bran is employed as a warm poultice in abdominal inflammation, spasms, &c., and an infusion is used as an emollient foot bath. It is also used internally in catarrhal affections.

Branch, Branching. In the widest sense we may speak of branching whenever one part gives rise to another similar one, be it the thallus of the lowest plants, or the root or stem of higher ones; more strictly, however, the term is restrained to the ramification of stems. Branches then 'are secondary stems developed from a primary one, or tertiary from these, and so on.' The growing point in many cryptogams forks constantly, while in the higher plants we have a potential branch in every vegetative bud except the terminal one which continues the main axis (see *BUD*). The number and position of the branches is thus in the first place determined by those of the leaves, but in the vast majority of cases such exuberant ramification is impossible, and many or most of such buds perish early or never even develop. This arrest depends largely on individual circumstances, and the branches may thus come to have a quite irregular or at anyrate undefinable position; yet this is by no means always the case, even in our trees. The general aspect of trees depends more upon their mode of branching than the form or exuberance of their foliage; notably that broadest of all arboreal contrasts, between the spire-like growth of the coniferous trees and the more spreading deciduous ones. In the conifers the lateral branches often perish and are thrown off from below upwards, and the adult stem thus appears branchless to a great height; yet even here sooner or later a branchy head is formed, as in the familiar Scots pine or the Italian pine. The predominance of the main axis over the branches may long persist in many deciduous trees, and especially in their fastigate varieties, like the Lombardy poplar; frequently, however, as in the elm, the main axis soon becomes altogether lost, or apparently continued by several main branches. The angle at which branches come off also largely varies; usually ascending and acute, they may be at a right angle—e.g. cedar—or even droop, as in 'weeping' trees. With regard to the conifers, it may be noticed that the shortened branchlet of the larch, with its tuft of needle-like leaves, is represented in the pines by a still more reduced form, which has only two leaves, surrounded at the base by a number of bud-scales. When the vegetative life of these ceases, the branchlet is disarticulated as a whole—a fact the more curious in relation to the separation of the large lower branches of the stem, which also snap off, leaving a clean cicatrix. That more or less distinct tendency to the development of the lateral buds, and the consequent subordination of the apical one, which all branching implies, may be traced from the general aspect of the tree into the details of its growth, and yet more fully into its inflorescence. Thus, while in the simplest case, the secondary axes are all subordinate to the primary one, as in

a pine-tree or a raceme, the growth of the branches tends continuously to predominate. The shorter, more rounded, and long-branched conifers and other trees, or the 'corymb' variety of the raceme, are the simplest cases of this; but more definite forms also arise. Thus, when the leaves are opposite, the large development of the lateral branches to an equality with the main stem may give a three-branched appearance, which is well exhibited by valerian (fig. 2). More frequently,



Fig. 1.—Mode of Branching in alternate-leaved plants; with series of modifications brought about by increasing subordination of the main axes and development of the secondary ones.

a, unmodified form, or racemose type; b, secondary axes lengthened (corymbose type); c, the secondary axes (arising in axils of leaves) nearly as well developed as main axis (Umbellifers); d, primary axis quite arrested after giving off its first axillary bud; this develops as a secondary axis, its bud as a tertiary, and so on, the stem being thus a composite or 'false' axis.

however, the development of the lateral branches exceeds that of the apical one altogether, which may be reduced to flower-bearing or totally arrested, and *false dichotomy* is the result; the autumnal arrest of the apical bud of the lilac, with development of its two lateral ones in spring, the apparent forking of the mistletoe, and the 'dichotomous cyme' of the pinks or chickweeds, are all familiar instances of this. Where the leaves are alternate we may also have an apparent forking, due to the equal development of the axillary branch, as often happens in Umbelliferae; or the main axis may be reduced to terminate in a flower, as in the scorpioid and helicoid cyme, or may be checked altogether, as in the shoot of the lime.



Fig. 2.—Similar modification of Branching in opposite-leaved plants:

e, primitive form; f, equal development of lateral branches (Valerian); g, arrest of main axis with development of secondary alone, and consequent resemblance to dichotomy (Mistletoe).

Where, as in most of these cases, the primary axis is not only checked by its secondary axis, but this bears a bud or tertiary axis, which again overpowers it, and so on, a *false axis* or *sympode* is formed. Physiologically indistinguishable from an ordinary main axis, examination shows that the leaves are not borne in the ordinary way, but have

developed the successive segments of stem in their respective axils.

The underground branches of a rhizome are often thickened as *tubers*; or they may send up tertiary branches to become new ascending axes—the *suckers* of the raspberry or rose. A *stolon* is a prostrate branch which roots at the tips and then develops an ascending branch; it may often be long and thread-like, and is then called a *runner* (strawberry). Branches may also undergo modifications from vegetative forms to new purposes—they may become sensitive and supporting as tendrils, their vegetative life may be diminished and their growing points hardened off as spines or thorns; the flower too is of course a reproductively shortened axis with modified appendages. See INFLORESCENCE.

Branchiæ. See GILLS.

Branchiopoda, a sub-order of Crustaceans in the order with leaf-like feet (Phyllopods). The name (gill-footed) refers to the fact that many of the numerous (10-40 pairs) appendages bear respiratory appendages. The body is distinctly jointed; the shell may be absent, shield-shaped, or bivalved; there are well-developed steering antennæ; the eggs are borne on several of the legs, or, in Branchipus and Artemia, in a special brood-sac. The heart is unusually elongated. They are mostly comparatively small, though not microscopic. The males often appear to be absent through a series of generations. The young mostly begin at the Nauplius (q.v.) stage, and pass through striking metamorphoses. None of the Branchiopoda are marine; a few live in salt lakes and brine-pools, the rest in fresh water. Only a few (*Apus*, *Estheria*) are known as fossils. See CRUSTACEA, BRINE-SHRIMP.

Branchiosotomum. See AMPHIOXUS.

Branco, Rio, a river of northern Brazil, rises in the Parana Mountains, on the very borders of Venezuela; and after a southerly course of about 400 miles, it joins the Rio Negro, of which it is the principal tributary, on its way to the Amazon.

Brancursine, a French popular name introduced by old writers for *Acanthus mollis* (see ACANTHUS); also applied to the Cow-parsnip (*Heracleum Sphondylium*).

Brand is the mark left upon the skins of cattle, often for the purpose of recognition by the owner, as in cattle-ranches in America, produced by searing with a hot iron; or a mark made in the same way on a cask or box for trade or excise purposes—hence the expression 'a good brand' of cigars, or the like (see FISHERIES and TRADE MARKS). The Branding of criminals is a separate article. The name Brand is given to the fungoid diseases or blights of grain crops—Bunt (q.v.), Mildew, Rust, and Smut (q.v.)—and refers to the burnt appearance which characterises the diseases to which it is applied. See PLANTS (DISEASES OF).

Brand, SIR JAN HENDRIK (1823-88), born at Cape Town, the son of Speaker Sir Christoffel Brand, was educated there and at Leyden, and became professor of Law in the South African College. As President of the Orange Free State (1864-88) he was regenerator of the country. He defeated the Basutos (1865-69). Though unsuccessful in the diamond-fields dispute, he did much to preserve friendly relations with Britain, and was instrumental in making peace between Britain and the Transvaal.

Brand, JOHN, antiquary, born in Durham county, 19th August 1744, was apprenticed to a cordwainer in Newcastle, and educated at the grammar-school there. His industry raised up for him patrons, who sent him to Oxford, where he gradu-

ated B.A. in 1775. He had been ordained some years previously, and in 1784 he was presented to a rectory in the city of London; in the same year he was elected resident secretary of the Society of Antiquaries, to which office he was re-elected annually until his death, 11th September 1806. His *Observations on Popular Antiquities*, first published in 1777, and edited with additions by Sir Henry Ellis (3 vols. 1813), was corrected, extended, and rearranged alphabetically as *Faiths and Folklore of the World* by W. C. Hazlitt in 1905.

Brandane. See BRENDAN.

Brande, WILLIAM THOMAS (1788-1866), chemist, born in London, studied chemistry at St George's Hospital, commenced lecturing on chemistry and physics in 1808, and was elected F.R.S. in 1809. He was professor of Chemistry to the Apothecaries' Company and at the Royal Institution, and head of the coinage department of the Mint. He published a *Manual of Chemistry* (1819), a *Dictionary of Materia Medica* (1839), and a *Dictionary of Science and Art* (1842).

Brandenburg, a province of Prussia, formed its nucleus, though it does not quite correspond with the old Mark of Brandenburg, which included parts of the province of Saxony and of Pomerania. Almost the whole province is a plain, so low that at Potsdam the surface of the river Havel is only about 15 English feet above the level of the sea. The ground becomes slightly hilly towards Silesia. In general, the soil is sandy and naturally unfruitful. Without its numerous rivers and canals, Brandenburg would be one of the most barren tracts on the Continent. The inhabitants are mostly Germans, mixed with French and Dutch colonists, who, however, are almost completely Germanised; and in the south of the province, with people of Wend extraction. Shipping, agriculture, and the rearing of cattle afford occupation for a considerable number. The chief manufactures are cotton, wool, linen, sugar, glass, tiles, and machinery. There are also numerous distilleries. The province is divided into the governments of Potsdam and Frankfurt—Berlin forming a separate jurisdiction. Area, 15,000 square miles; population (exclusive of Berlin) in 1880, 2,266,651; in 1910, 4,092,616, of whom all but about 300,000 Roman Catholics, 61,000 Jews, and 54,000 others were Protestant; (1919) 2,445,627. In the beginning of the Christian era, Brandenburg was inhabited by the Semnones, and afterwards by Slavonic tribes. In 927 Henry I. defeated the latter at the Elbe, and plundered their capital of Brennbior, afterwards raising the district into a Mark (q.v.). Albert the Bear (q.v.) became the first Markgraf in 1134, and Frederick of Nuremberg the first Elector in 1415. The Mark or Electorate became united with the duchy of Prussia in 1611, which, under the Great Elector, Frederick-William I., shook off the suzerainty of Poland in 1657, to become, under the Great Elector's son Frederick, in 1701, the kingdom of Prussia. See PRUSSIA.

Brandenburg, the ancient *Brennbior* of the Wends, 38 miles WSW. of Berlin. The Old Town and the New are on either side of the Havel; on an island in the river stand the castle and the cathedral (14th century), with a fine crypt. The manufactures include woollens, silks, hats, baskets, leather, and starch. Pop. 53,000.

Brandenburg, NEU. See NEUBRANDENBURG.

Brandes, GEORGE, a Danish literary critic of Jewish family, born 4th February 1842, in Copenhagen, where he graduated at the university in 1864. Several books on aesthetic and philosophic subjects brought on him a charge of scepticism, which was not removed by an epoch-making series

of lectures, delivered before large audiences, and published as *Main Currents in Nineteenth Century Literature* (1872-75; trans. 6 vols. 1901-5); for his description of the later intellectual position of Europe, as broken away from the orthodoxy and romanticism of the beginning of the century, brought on him the bitter attacks of all the reactionary forces in Denmark. His *Danske Digtere*, a masterpiece of psychological analysis, appeared in 1877; but the hostility of his enemies induced him in the same year to leave Denmark and settle in Berlin, where he published, among other works, critical biographies of Lassalle (1877), Esaias Tegnér (1878), and Lord Beaconsfield (1879). A lecture tour through Norway and Denmark brought a powerful party to his side, and in 1883 he returned to Copenhagen. Later works include *Den Romantiske Skole i Frankrig* (1882); a *Life of Holberg* (1885); three books on Ibsen (1867, 1882, and 1898), translated into English and published together; *Shakespeare: a Critical Study*; *Goethe*; and an Autobiography.

Branding has been practised from very early times. The Greeks marked their slaves with the *stigma*; in Rome, runaway slaves (*fugitivi*) and thieves (*fures*) were branded with the letter F; and the slaves who worked in the mines, and convicts condemned to the games or to the mines, were also branded on the forehead for identification. Constantine limited branding to the hand, arm, or calf; the face had been fashioned in the image of God, and was to be protected from such degradation. The Canon Law provided for this punishment, and in France, down to 1832, galley slaves were marked T F (*travaux forcés*); but in Germany it has never been recognised by the common law. Under the ancient law of England, branding was practised for various offences by the application of a hot iron, the end of which had the form which it was desired should be left imprinted on the skin. The famous Statute of Vagabonds under Edward VI. authorised the branding of the letter V on the breast of a runaway servant; and where such a servant had been sold, and afterwards escaped, he might be branded with the letter S on cheek and forehead as a slave. In the same reign, Brawling (q.v.) in church was punished by branding with the letter F on the cheek as a fraymaker. During the two centuries of persecution to which the Gypsies were subjected throughout Europe, this was a mild form of punishment; in 1636 some 'Egyptianis' were sentenced at Haddington, 'the men to be hangit, and the weomen to be drowned; and suche of the weomen as hes children to be scourgit throw the burgh and brunt in the cheeke.' In the time of Henry VII. branding had been substituted for ecclesiastical compurgation in the case of all *clergiable* offences by burning on the hand (see *BENEFIT OF CLERGY*); and with a view still further to repress theft and petty larceny, it was provided in 1698 that such offenders as had the benefit of clergy allowed them should be 'burnt in the most visible part of the left cheek, nearest the nose.' This additional severity, however, had not the desired deterrent effect, and was repealed in 1707. Cold branding, or branding with cold irons, was a way of nominally inflicting the penalty. Branding was discontinued in the reign of George III., and finally done away with in 1829. Army 'branding' or 'marking' with the letter D. or B. C. (Deserter or Bad Character), by tattooing with needles and Indian ink, *not* by burning, was abolished in 1879.

Brandis, CHRISTIAN AUGUST, was born in 1790 at Hildesheim, and from 1822 till his death on 24th July 1867, was professor of Philosophy at Bonn,

except that during 1837-39 he was cabinet-counsellor to the young king of Greece. With Bekker, he edited Aristotle, and he published two works on ancient philosophy. His son Johannes (1830-73) wrote on numismatics and Assyrian archaeology.

Brandl, ALOIS, born at Innsbruck in 1855, became professor of English philology at Berlin in 1895, and wrote on old English literature, the drama, Coleridge, &c.

Brandling. See PAR and SALMON.

Brandon, an important mining-town in the county of Durham, 3 miles SSW. from Durham; pop. with Byshottles (urban district), 19,000.—**BRANDON**, a quaint old market-town, mostly on the Suffolk side of the Little Ouse, 7½ miles NW. of Thetford. The *Grimes Graves* close by are Neolithic flint-workings. Gun-flints are still made, chiefly for the African market; and the continuity of the 'flint-knapping' industry, though now almost extinct, can be traced from early prehistoric periods.

Brandon, a city of growing importance in Manitoba, Canada, below the junction of the Assiniboine and Little Saskatchewan rivers, in a prolific wheat-growing district. Founded in 1881, it had in 1882 over 1500 houses. Pop. 15,000.

Brandt, SEBASTIAN, author of the *Narrenschiff*, or *Ship of Fools*, was born at Strasburg, 1458; studied law and the classics with zeal at Basel, where he received permission to teach; and soon became one of the most influential lecturers in that city. The Emperor Maximilian showed his regard for Brandt by appointing him an imperial councillor. He died at Strasburg in 1521. His *Ship of Fools*, a satire on the follies and vices of his times, which was published at Basel (1494), is not very poetical, but is full of sound sense and good moral teaching, and was so much esteemed that the German popular preacher Geiler occasionally took his texts from it. The best editions are by Zarncke (1854), and Goedeke (1872). It has appeared in almost every European language; it was translated into Latin by Locher (1497), and into English by Henry Watson, *The Grete Shyppe of Fooles of the Worlde* (1509); partly translated and partly imitated by Alexander Barclay (q.v.), and imitated by W. H. Ireland in the *Modern Ship of Fools* (1807).

Brandy (Fr. *eau de vie*) is a term properly restricted to the liquid obtained by distilling the fermented juice of the grape. The fermented liquors or wines which are employed for that purpose are various, and contain a proportion of Alcohol (q.v.), which runs from 10 to 25 per cent. of their weight. The red wines generally are preferred. In the 17th century, French brandy was made only from white wine. About 1000 gallons of wine give by distillation from 100 to 150 gallons of brandy, which varies in strength, but is generally diluted with water till it contains from 50 to 54 per cent. by weight of absolute alcohol. When originally distilled, brandy is clear and colourless, and if wished to remain so, is received and kept in glass vessels; but when placed in wooden casks, the spirit dissolves out the colouring matter of the wood, and acquires a light sherry tint, which may be deepened by burnt sugar and other colouring matter, intentionally added by the dealers. The pleasant aroma of brandy is due to the presence of more or less Fusel Oil (q.v.) accompanied by (Enanthic Ether (q.v.), derived from a volatile oil in the husk of the grape. The most famous brandy is that distilled in the country round Cognac, in Charente, in the west of France, from the choicest wines, but comparatively little of that sold under the name of *Cognac* comes from this district. *Armagnac* is the brandy of another district. Since the vines of

France have suffered from oïdium, phylloxera, and mildew, only a very small proportion of what is imported and sold as Cognac is made from wine, or even from cider, grape refuse, wine lees, and fruit. In the last quarter of the 19th century there was good reason to believe that too many French houses imported potato-spirit in large quantities from Germany, and reshipped it to England as French brandy; beetroot-spirit is also much used, the coarse spirit being flavoured with ceananthic ether, with Cognac oil (made from palm oil), the essential oil distilled from husks of the grape, and other flavouring matters. Much brandy is distilled in Portugal, almost exclusively from white grapes (which contain more alcohol than red ones), and a small quantity is also made from grape refuse (*marc*). To produce 1 gallon of this brandy, 5 to 7½ gallons of wine are required. This brandy contains 75 per cent. of absolute alcohol (33 over proof of Sykes), and is principally used in checking fermentation in wine-making, and in preserving the sweetness of Portuguese wine. Brandy is also exported by Spain, Australia, Algiers, Greece, and Egypt. Some of the brandy sold in Great Britain and Ireland is prepared at home from ordinary grain-alcohol, by adding thereto Argol (q.v.), bruised French plums, some French wine-vinegar, a little good Cognac, and redistilling. The Germans use the name *Branntwein* for all kinds of grain-spirit, or that distilled from plums, blue-berries, &c. *Kirschwasser* or *kirschbranntwein* is distilled from cherries and their kernels. In England *cherry-brandy* is brandy in which cherries have been steeped and preserved. In the United States brandy was also made from cherries, apples, pears, and peaches; and the States exported much common whisky to France, which was re-imported as brandy. In 1909 a royal commission expressed the opinion that, although in old statutes the term brandy was a perfectly general expression for potable spirit, it was now by association in the minds of consumers, and by the custom of the trade, restricted to spirits derived from the grape. It sanctioned, however, the use of the name British brandy for the compounded spirit so called. Brandy is frequently administered as a stimulant, and in cases of suspended animation, exhaustion, and in mild diarrhoea. It may be used externally for checking hemorrhage, and for hardening tender skin. See ALCOHOL (USES OF), DISTILLATION, WINE.

Brandywine Creek, a stream rising in Chester county, Pennsylvania, flowing with a general south-easterly course into Delaware, and emptying into Christiana Creek at the city of Wilmington. A battle was fought on its banks, 11th September 1777, in which 13,000 Americans, under Washington, were defeated by a force of 18,000 British, under Lord Howe.

Brangwyn, FRANK, R.A., was born at Bruges, of Welsh extraction, in 1867, and worked with William Morris in decoration. Afterwards he travelled in the East, and developed as a colorist. Besides painting, he has practised etching and other methods of art. See two books by Shaw-Sparrow (1910, 1918).

Branks, rarely BRANK, the Scottish name for a bridle or halter, but specifically for what in England is called 'the scold's bridle.' It is said to be of Scottish origin. According to Mr Llewellynn Jewitt it was never a *legalised* instrument of punishment, although corporations and lords of the manor in England, and town-councils, kirk-sessions, and barony courts in Scotland, exercised the right of inflicting such punishment. Men were put in the stocks or pillory, women in the branks, for such petty misdemeanours as are now described as breaches

of the peace, using abusive, insulting, or threatening language, cursing and swearing, and contumacy. The brank in its simplest form is a hoop of iron, opening by hinges at the sides, so as to inclose the head, and fastened by a staple with a padlock at the back; a plate within the front of the hoop projecting inwards, so as to fit into the mouth of the culprit, and by pressing upon the tongue, be an effectual gag. In some instances this mouth-plate was armed with a knife or point which cut the tongue if moved. In its last most complicated shape, the brank, by the multiplication of its hoops and bands, took the form of a conical cage or lantern, the front taking the shape of a rude mask, with holes for mouth, nose, and eyes; in one instance, the mask quite covers the face. With this cage upon her head the unfortunate woman was paraded through the streets by the bellman, beadle, or constable, or was chained to the market cross, a target for ridicule and insult. When the brank first came into use is unknown. It is found at Edinburgh in 1567, at Glasgow in 1574 and 1596, at Stirling in 1600, at Macclesfield in Cheshire in 1623, at Newcastle-on-Tyne in 1655, Worcester in 1658, Congleton in 1662, at Chesterfield, the only instance in Derbyshire, in 1688. Cheshire had thirteen examples extant in 1660. An old description of the Isle of Man mentions the tongue of a scandalous person being tied with a noose of leather called a bridle. One brank in the church of Walton-on-Thames, in Surrey, has the date of 1633. In another, called 'the witches' bridle of Forfar,' dated 1661, the gag for the mouth is not a flat plate, but a long piece of iron with three sharp spikes. A brank at Stockport was somewhat of the same description. Of examples in private custody in England, one had the date of 1688, the other the crowned cipher of King William III., and another had a mask with apertures for the eyes, a prominence to fit the nose, and a long funnel-shaped peak projecting from the mouth. The brank was used at Langholm, in Dumfriesshire, in 1772; at Morpeth in 1741; it was used at a later date at Manchester and at Macclesfield; and at Bolton-le-Moors, in Lancashire, the iron bridle was in use up to 1856 for the correction of immorality. Examples of the brank may be seen in the Ashmolean Museum at Oxford, in the National Museum of the Antiquaries of Scotland at Edinburgh, at Abbotsford, in the county-hall at Forfar, in the Guildhall at Lichfield, at Leicester, Newcastle-on-Tyne, Shrewsbury, in the town-hall at Macclesfield, in the parish church of Walton in Surrey, and in St Mary's Church at St Andrews in Fife; Chester has four examples. Brank was at one time a common name in Scotland for any sort of bridle, and the word is so used by Burns. The word is derived from the Gaelic *brangus*, an instrument for punishing petty offences, *brang*, a halter, words cognate with the Dutch *pranger*, pincers, and the German *pranger*, a pillory. See the paper by Llewellynn Jewitt, F.S.A., 'Scolds; and How they Cured them in the "Good Old Times,"' in *Reliquary*, vol. i. (1860-61); also notes in vol. xiii. (1872-73); and Andrews, *Punishments in the Olden Times*. See JOUGS.—The affection called *Mumps* (q.v.), causing a swelling about the jaws or neck, is in Scotland vulgarly known as the *branks*.



Branks.

Brant, JOSEPH, chief of the Mohawk Indians, born in 1742, fought on the side of the British in the Indian and Revolutionary wars. In the latter he headed several fierce raids against the colonists, but was equally zealous afterwards in exerting his immense influence to bring about a general Indian peace. In later years an earnest Christian, he translated the Gospel of St Mark and the English Prayer-book into Mohawk, and in 1786 visited England to raise funds for the erection of the first Episcopal church in Upper Canada. He died 24th November 1807. He was a brave warrior, a sagacious leader, loyal to his friends, and merciful to his captives. A monument, surmounted by a colossal bronze statue, was unveiled at Brantford in 1886.

Brant, SEBASTIAN. See BRANDT.

Brantford, a city and port of entry of Brant county, Ontario, 24 miles SW. of Hamilton, on the Grand River, which is navigable to within 2½ miles of the town, from which point a canal affords a waterway to Lake Erie. There are manufactures of electrical appliances, &c. Pop. 30,000.

Brantôme, PIERRE DE BOURDELLES, SEIGNEUR DE, one of the most notable of French memoir-writers, was born about 1540 in the province of Périgord. The exact date and place of his birth are unknown. He was the third son of François, Comte de Bourdellès, and was educated at Paris and at Poitiers. In his sixteenth year the abbacy of Brantôme was bestowed on him by Henry II., but he never took orders, and spent most of his life as a courtier and free-lance. In 1561 he accompanied Mary Stuart on her journey from France to Holyrood, and in 1565 he joined the expedition sent to Malta to assist the Knights of St John against the sultan. He served in Italy under the Maréchal de Brissac, in Africa under the Spaniards, and in Hungary as a volunteer against the Turks. He was made chamberlain to Charles IX. and Henry III., and took part against the Huguenots in the religious wars of his time. About 1594 he began to write his memoirs, and thenceforth lived in retirement until his death on the 15th of July 1614. His works were not published until 1659. They comprise *Vies des Grands Capitaines Étrangers et Français*, *Vies des Dames Galantes*, and *Vies des Dames Illustres*. Their literary merit and historical interest are very considerable. Their matter is often of the most scandalous description, but they give a wonderfully vivid and faithful picture of their author's times. Brantôme depicts the corrupt court society with the most complacent frankness; he writes as if he were immoralised rather than demoralised. He had a keen eye for character; the men and women who appear in his crowded, brightly-coloured pictures have each a lifelike, sharply-marked individuality. His style is easy, lively, and picturesque. There are editions of Brantôme by Lacour and Méricme (13 vols. 1859-94), and by Lalanne (12 vols. 1865-96).

Brash. See PYROSIS.

Brasidas, the greatest Spartan general in the earlier years of the Peloponnesian war. Already in 431 B.C. he had distinguished himself by the courage with which he relieved the town of Methone from a hostile attack, for which he was made one of the chief-magistrates of Sparta. In 424 he relieved Megara, and he was no less successful through combined diplomacy and military skill in his expedition to Macedonia, the same year, for the purpose of seducing the cities from their allegiance to Athens. His greatest acquisition was Amphipolis. Here in 422 he had to encounter with a handful of helots and mercenaries, the flower of the Athenian army under Cleon. In

the battle both generals were killed, but the army of the Athenians was completely beaten. He was buried at Amphipolis within the walls, and for long after his death his memory was honoured as that of a hero by the celebration of yearly sacrifices and games. Thucydides speaks of the eloquence of Brasidas, so unusual in a Spartan, as well as his justice, liberality, and wisdom; while Plato compares him to Achilles.

Brasov, Rumanian name of Kronstadt (q.v.).

Brass. See BRASS ESTUARY.

Brass. In ancient history frequent allusions are made to the employment of brass in the construction of musical instruments, vessels, implements, ornaments, and even gates; but as no mention is made of its mode of manufacture, or even of its composition, it is doubtful if the brass of the ancients, with the exception of some made by the Romans, was composed of copper and zinc. Analysis of some of their coins shows that the ancient Romans were well acquainted with the art of preparing brass, in the sense of an alloy of copper and zinc. Zinc does not appear to have been known as a separate metal in Europe till the 16th century; but zinc ore was employed by the Romans along with copper to prepare brass. However, it was bronze, and to some extent iron, not ordinary brass, that was all but universally used by them for metal objects other than those made of gold and silver. See BRONZE AGE.

The term brass is now commonly understood to mean an alloy of copper and zinc, containing more than 50 per cent. of copper. Bronze (q.v.), on the other hand, means a similar alloy of copper and tin. But the word brass formerly meant bronze, and it has been used as a generic term, so as to include bronze as well as alloys of copper and lead. In this way, under one general name, there would be a zinc, a tin, and a lead group of alloys. For the tin group, see BRONZE.

ZINC GROUP—

Pinchbeck brass.....	4 of copper to 1 of zinc.
Dutch brass (Dutch metal).....	3 " 1 "
Yellow brass.....	2 " 1 "
Pale brass.....	1.75 " 1 "
Ship sheathing brass (Muntz's metal).....	1.50 " 1 "

LEAD GROUP—

Stopcock metal.....	4 parts of copper, 1 of lead, 1 of zinc, and ¼ of tin.
"	2 parts of copper, 1 of lead, and 1 of tin.
Tap and pot metals..	Various proportions, from ⅓ to 1 part of copper to 1 of lead.

A tough brass for engine-work can be made of copper 6½, tin 1, and zinc 1; and another kind for very heavy bearings of copper 6½, tin 1, and zinc ½. See ALLOY.

As a rule, brass is easily fusible and also very malleable and ductile. Therefore it can be readily cast into moulds, rolled into sheets, hammered or stamped into various shapes, and drawn into wire. It is likewise of a pleasing colour. Brass is harder, and so stands wear better than copper, resists atmospheric influences as well, and is cheaper than that metal. These valuable properties render it next in importance to iron and steel in the metallurgical arts. The malleability of brass, however, varies with its composition, with the temperature, and with the presence, even in minute quantities, of foreign metals. Some kinds are malleable only while cold, others only while hot, and there are varieties wanting in this property at any temperature. All kinds become brittle if heated well up to their fusing-point.

Brass is more tenacious than any of the common metals except iron, steel, and copper. But if subjected to a continuous tension for some length of time, it undergoes, in many cases at least, a molecular change, and loses its tenacity. It is therefore

not quite safe to hang pictures with heavy frames or weights of any kind on brass chains or wire. The surface of this metal, if not protected by lacquer, soon tarnishes and becomes black.

The old process of making brass by mixing small bits of copper with powdered zinc ore, and heating the mixture in pots in a furnace, is now almost obsolete. The modern way of preparing it is by mixing metallic zinc directly with copper in crucibles or in a furnace. The copper is first melted, and the zinc then added in a hot state, care being required to prevent much loss by the latter volatilising. When other metals are added they are also heated first.

The molten brass is either poured into moulds to form ingots for remelting, or more commonly into ordinary sand moulds prepared from patterns. Methods of brass-founding, long primitive, were changed by the introduction of the electric furnace. The heat of the electric arc may be used; or the metal may be melted by electric currents induced in it. Brass takes a sharp impression when cast in a mould. Plates or slabs for rolling into sheets are cast between two marble blocks thinly lined with loam, the sides and ends being made up with sand. These are reduced by 'breaking-down rollers,' and afterwards by other rollers, till they become of the required thickness. As is the case with tube and wire drawing, these sheets are annealed at intervals during the process of rolling. See ANNEALING.

Ordinary drawn brass tubes are soldered longitudinally, but the tubes for locomotive boilers are formed by drawing out a solid cylinder of brass. This was looked upon as a great feat when the process, after many trials, first succeeded in 1838.

Industries which either wholly or partially depend upon brass for raw material are numerous and varied. Birmingham is their headquarters. See METALLURGY, METAL-WORK, WIRE. For nickel brass, unhappily named nickel silver, see GERMAN SILVER.

Brasses, MONUMENTAL, large plates of brass, or of the mixed metal called *latten* or *laton*, inlaid on slabs of stone, and usually forming part of the pavement of a church. The figure of the person intended to be commemorated was generally represented either by the form of the brass itself, or by lines engraven on it. Such, however, was not always the case, an ornamented or foliated cross, with other sacred emblems, being frequently substituted for the figure. Nor was the practice of imbedding them in the pavement uniform, as we sometimes find them elevated on what were called altar-tombs. The incised lines on these brasses were occasionally filled up with *niello*, and in the case of armorial decorations and the like, the field or background was often cut out by the chisel, and filled up with some species of coarse enamel, by which means the appropriate tinctures were produced. In England, the brass was usually of the form of the figure, the polished slab forming the ground, and the ornaments, arms, inscription, &c. were also inserted each as a separate piece. On the Continent, where the metal was more abundant, the brasses were one long unbroken surface, formed of plates soldered together, on which were engraved all the objects represented, the portions of the plate not so occupied being ornamented by elaborate flower-work. Brasses are known to have been used for monumental purposes from an early period, though there are no existing traces of them in England previous to the middle of the 13th century. There is reason to think that, if not imported from France, they were at first executed by French artists, but as no example of a brass exists now in France, it is impossible to establish this. Subsequently the art took root in England,

and English brasses, like English architecture, acquired a distinctive national character. The oldest complete specimen in England is that on the monument of Sir John d'Aubernoun, at Stoke d'Abernon, in Surrey. The knight died in 1277, and it is probable that the brass was executed shortly after that date. Next in antiquity are those of Sir Roger de Trumpington, who died in 1289, and of Sir Richard de Buslingthorpe, 1290; the former at Trumpington in Cambridgeshire, the latter at Buslingthorpe in Lincolnshire. In addition to the interest which they possess from their age, these brasses are remarkable as being still unsurpassed in the beauty of the workmanship and the spirit of the design. In the following century (1325), on the brass of Sir John de Creke, at Westley Waterless, in Cambridgeshire, the artist's



Inlaid brass Monument of Eleanor Bohun, Duchess of Gloucester (about 1400).

mark is affixed by a stamp—a fact which has been regarded as a proof that his craft had attained to some importance, and that his services were pretty frequently called into requisition. But in this case, as in every other, with one exception, the name of the artist has perished. The exceptional case is that of the brass which once covered the tomb of Bishop Philip, in the church of the Jacobins at Evreux, in Normandy, where the inscription ended with the words, 'Guillaume de Plalli me fecit.' Some of the brasses executed in England in the 14th century are probably Flemish; and in the churches at Bruges some exist which appear to be by the same hand as others which are found in England. But England is the only country which now possesses a series of brasses fairly representative of the different periods,

and exhibiting the characteristics of a national style. Very few brasses are to be found in Wales, and there are only two on record in Ireland, and three unimportant examples in Scotland. For this, as for most other arts that subsequently flourished in Britain, we were indebted to the artists of France and Flanders, who in their turn were debtors to Byzantine craftsmen for the art of working in brass also. Of late years there has been a decided revival, not merely of interest in the art, but in the use of it in Britain for its original purpose—for the most part in rather close imitation of ancient patterns and methods.

See Cotman's *Sepulchral Brasses in Norfolk* (1819), Boutell's *Monumental Brasses of England* (1849), Haines' *Monumental Brasses* (1861), Greeny's *Monumental Brasses of the Continent of Europe* (1884), and Macklin's *Monumental Brasses* (1891; 6th ed. 1913), and *Brasses of England* (1907).

Brass Estuary, or **BRASS RIVER**, one of the deltaic mouths of the Niger (q.v.), east of the Nun mouth, entering the sea about 6° 15' E. long. On it is Brass City, and hence the Brassmen, energetic savages, are named. The country is in Nigeria.

Brassey, **THOMAS**, the great railway-contractor, was born, a farmer's son, at Buerton near Chester, 7th November 1805, was educated at Chester, articled to a land-surveyor, and in 1826 had charge of a business in this line at Birkenhead. In 1834 he obtained, through George Stephenson, contracts for a viaduct on the Grand Junction line. Settling in London in 1836 he turned his great energies and business ability into his profession as a railway-contractor, for which the development of the railway-system presented a good opening. His operations soon extended to all parts of the world. Amongst his chief contracts was the Great Northern Railway (1847–51), when he had in his employment between 5000 and 6000 men; as also French, Italian, Canadian, Australian, and Indian railways. He died at Hastings, 8th December 1870. See *Life by Helps* (1872).—His eldest son, **THOMAS, EARL BRASSEY** (1836–1918), born at Stafford, was called to the bar in 1866. He was elected for Devonport in 1865, and afterwards represented Hastings (1868–86). As Civil Lord of the Admiralty (1880), and Secretary (1884), his influence was felt in naval questions, and he was author of several works on seamanship, naval affairs, and yachting. He was made K.C.B. in 1880, a baron in 1886, and an earl in 1911. In 1895–1900 he was governor of Victoria. Lady Brassey's pleasant records of the yacht voyage round the world in 1876–77, and of succeeding trips of the *Sunbeam*, including the *Last Voyage* (1889), were widely popular. She died at sea, 14th September 1887.

Brassica, the turnip and cabbage genus of the Cruciferae (q.v.). The Wild Cabbage (*B. oleracea*) occurs on the west and south coasts of England, Ireland, and the Continent, particularly on sea-cliffs. The cultivated forms are of great economic importance, and are enumerated by Hooker as varieties: (a) *acephala* (Scotch kale, cow-cabbage, borecole, see **KALE**); (b) *bulleata* (savoy); (c) *gemmifera* (Brussels Sprouts, q.v.); (d) *capitata* (red and white cabbage, see **CABBAGE**); (e) *caulorapa* (Kohlrabi, q.v.); (f) *botrytis* (Cauliflower and Broccoli, q.v.). The Turnip (*B. campestris* [*polymorpha*]) has also many annual or biennial varieties: of these *B. campestris* proper is cultivated as the Swedish turnip. *B. campestris*, sub-species *Rapa*, is the common Turnip (q.v.); and the sub-species *Napus* is the rape or coleseed. The Isle of Man Cabbage (*B. monensis*) occurs on sandy shores, and its cultivation in such soils has accordingly been suggested as fodder for cattle. For the sub-genus *Sinapis*, see **MUSTARD**.

Brasso, Magyar name of Kronstadt (q.v.).

Brathwaite, **RICHARD**, minor poet, was born in Westmorland about 1588; entered Oriel College, Oxford, at sixteen; passed afterwards to Cambridge, Pembroke College most likely, and thence to London, where he tells us he devoted himself to poetry and play-writing. In 1611 he published *The Golden Fleece*, a collection of poems, and in 1614 three works, one of them a book of pastorals, entitled *The Poet's Willow*. In 1615 he published the collection of satires, *A Strappado for the Devil*, in imitation of *The Abuses Whipt and Stript* of George Wither, his 'bonnie brother.' After his first marriage, Brathwaite lived the life of a country gentleman in Westmorland, and after his second in Yorkshire, without, however, ceasing his literary activity. He died near Richmond, in Yorkshire, in 1673. Of his numerous books, the only one that remains to be mentioned is *Barnabe Ruminarium*, or *Barnabee's Journal*, published in 1638 under the pseudonym 'Corymbæus.' Often reprinted under the title of 'Drunken Barnaby's Four Journeys,' this lively book in rhymed Latin and doggerel English verse was popular in the 18th century. With the seventh edition, edited by Joseph Haslewood in 1818, its authorship was first made known. See the life and bibliography in Haslewood's ninth edition (1820).

Bratianu, or **BRATIANO**, **JON** (1821–91), Rumanian statesman and writer, took part in the revolutions of 1848 and 1866, and was Liberal prime-minister in 1876–88. His son **JON** (born 1866) was several times prime-minister, and in 1916 brought Rumania into the Great War. See **RUMANIA**.

Bratislava, Czech name of Presburg (q.v.).

Bratislavia, Latin name of Breslau (q.v.).

Brattleboro, a town of Windham county, Vermont, 95 miles S. of Montpelier, on the Connecticut River, here bridged. Organs, carriages, furniture, and machinery are made, and the town is a centre of the maple-sugar industry. Pop. 8000.

Brauer, **ADRIAN**. See **BROUWER**.

Braun, **ALEXANDER**, born at Ratisbon in 1805, was professor of Botany at Berlin from 1852 till his death, 29th March 1877. He did special service in the departments of the morphology of plants, systematisation, and the lower cryptogams. See his *Life* by Mettenius (Berlin, 1892).

Braun, **AUGUST EMIL**, archæologist, born at Gotha in 1809, studied at Göttingen and Munich, and in 1833 went to Rome, where in a short time he was made secretary to the Archæological Institute. He wrote many valuable works on art and mythology in German and Italian. Of these the most important are his *Vorschule der Kunstmythologie* (1854), and an admirable guide-book, *Die Ruinen und Museen Roms* (1854), both of which have been translated into English. He died in Rome, September 12, 1856.

Braunsberg, a town of East Prussia, on the navigable Passarge, 8 miles from its mouth, and 38 miles SW. of Königsberg by rail. It contains a Catholic seminary and gymnasium, oil and flour mills, breweries, match and soap factories. A considerable trade is carried on in yarn, grain, flax, and ship-timber. Pop. 15,000.

Braunschweig. See **BRUNSWICK**.

Brauer. See **BROUWER**.

Bra'vo ('excellent!' 'well done!'), an Italian exclamation of praise, the superlative form of which is *Bravissimo!* It is commonly used in England without distinction of number or gender; but the Italians say *bravo!* to a male singer or actor, *brava!* to a lady, and *bravi!* to a company.

Bravoës were those persons in Italy, but

especially in Venice, who undertook to perform any dangerous deeds for money. The name is now employed chiefly to designate hired assassins.

Bravura, an Italian word, in music applied to a composition as well as style of performance. As a composition, the bravura is a florid air or song, with many difficult and rapid passages, requiring great spirit and dexterity of execution. The intention of merely astonishing by execution has been carried to such an extent that it has brought this species of composition into undeserved discredit. The compositions of Mozart, for instance, give abundant proofs of how true artistic merit may be united with the bravura style.

Brawne, FANNY. See KEATS.

Braxfield, ROBERT MACQUEEN, LORD (1722-1799), 'hanging judge,' the son of John Macqueen of Braxfield, Sheriff-substitute of the Upper Ward of Lanarkshire, was educated at Lanark Grammar School and Edinburgh University, and apprenticed to a Writer to the Signet. Called to the bar in 1744, he soon had the best reputation and practice as a feudal lawyer in the country. He was made a Lord of Session in 1776, Lord of Justiciary in 1780, and Lord Justice Clerk in 1788. He presided at the trials of Muir, Skirving, and others for sedition in 1793-94, and in these, says Cockburn, 'he was the Jeffreys of Scotland.' He even wrote privately to Dundas, urging that no mercy should be shown. 'Bring me the prisoners,' he used to say when consulted as to a political prosecution, 'and I will find you the law.' He was coarse, brutal, and domineering, and delighted in indecorous jests, but he was a man of remarkable vigour of intellect. See Stevenson's *Weir of Hermiston*, Cockburn's *Memorials*.

Braxy, or SICKNESS, a very fatal disease of sheep, which frequently causes a heavy mortality in some parts of the country. It is very rapidly fatal, and animals are more frequently found dead than seen ill. There is no doubt but deaths are ascribed to braxy which are due to other causes. Although it may occasionally occur in any part of the country, it is the wet hilly districts on our west coast that its ravages are mainly felt. The late Professor Hamilton of Aberdeen—head of the Departmental Committee—stated that it was met with on the west coasts of countries touched by the Gulf Stream—the Shetland and Faeroe Isles, Iceland, and the west coast of Norway. It attacks mostly lambs, and sheep under two years old, but occasionally an older animal may succumb to it. Decomposition sets in rapidly after death. Often by the time the carcass is found it is distended with gas, the legs sticking straight out, the skin of the belly getting discoloured, and the wool easily pulled off. On opening the carcass the smell is very powerful, penetrating, and disagreeable; hence the name 'stinking-ill' sometimes applied to the disease. The tissues are all darker—redder—than normal, and hæmorrhages, mostly small points, are found on nearly all surfaces—often largest and most obvious inside the true stomach. According to Dr M'Gowan, they are more constant on the heart and its membranes in minute points, and the heart sack full of an amber-coloured or blood-stained fluid. The flesh is said to be harmless, and in districts where the disease is prevalent 'braxy mutton' is a recognised article of food.

Probably owing to the heavy mortality sometimes caused by it, more inquiry has been directed to the causation and prevention of braxy than to any other disease of stock in this country. The Board of Agriculture appointed a 'Departmental Committee' to inquire into it, and their final report—published in 1906—ascribed the disease to

a bacillus found in the peritoneal cavity, and as a preventive recommended drenching the lambs with cultures of this bacillus. A subsequent investigator, Dr M'Gowan, who worked under the auspices of the Board of Agriculture for Scotland, denies the pathogenic nature of this organism, and states that it is a common putrefactive bacterium due to decomposition. He claims that the specific agent in the causation of the disease is a much smaller organism, which he discovered in the blood, and termed the *Bacillus bipolaris septicus ovium*.

Amongst the causes that seem obvious to flock-masters are sudden changes of weather and of food, more particularly from poor to rich pasture; storms of wind and rain; frosty nights after fairly warm days, especially when all vegetation is covered with hoar-frost in the morning; foul pasture; and some parts of a sheep-run—especially hollows—are more liable to cause it than others. The disease is most common in the autumn from September onwards, and again in spring it is sometimes prevalent. Treatment is seldom available, as the victim is usually found dead. As it is generally the best of the flock that are attacked, the most vigorous and thriving, temporarily to stop or check this thriving is considered a means of prevention. It is to this cause that many ascribe the diminished mortality claimed to be derived from drenching the lambs with a mixture of pig-dung and milk. Good and careful herding, watching the weather, and not allowing the sheep on to rank foggage with hoar-frost on it, and, if frost cannot be avoided, putting the flock on the cleanest, barest pasture available, where it is impossible for them to fill their stomachs rapidly with frosted grass, are recommended.

Bray, a small Berkshire parish, near Maidenhead, of which Simon Aleyn was vicar from 1540 to 1588, during the reigns of Henry VIII., Edward VI., Mary, and Elizabeth. He kept his vicarage by changing his faith according to that of the state for the time being, becoming a Protestant with Henry, Catholic again in the reign of Mary, and Protestant again on the accession of Elizabeth. His principle was to live and die vicar of Bray, and to it he adhered. The modern ballad, *In Good King Charles's Golden Days*, makes the versatile vicar live in the reigns of Charles II., James II., William III., Anne, and George I.

Bray, a seaside town, partly in Dublin county, but chiefly in Wicklow, 13 miles SE. of Dublin by rail. The beauty of its situation has raised it from a small fishing-village to a watering-place, popularly known as the 'Irish Brighton,' with well-built houses, and an esplanade a mile long, hotels, and Turkish baths. Pop. 7700.

Bray is a district of Normandy, now the south-eastern part of Seine-Inférieure, famous for its cattle and dairy produce.

Bray, ANNA ELIZA (née Kempe), author, was born in London, 25th December 1790, and was intended for the stage, but in 1818 married the artist Charles Alfred Stothard (q.v.). In 1825 she married the Rev. E. A. Bray (1778-1857), vicar of Tavistock; and after his death she settled in London, where she died, 21st January 1883. Between 1820 and 1874 she published a score of romances, books of travel, and other works, the best being *The Borders of the Tamar and the Tavy* (1836; 2d ed. 1879); *Life of Thomas Stothard, R.A.* (1851); and *A Peep at the Pixies* (1854). See her Autobiography (ed. Kempe, 1884).

Bray, THOMAS, divine and philanthropist, born at Marton, in Shropshire, in 1656. From Oswestry School he passed to All Souls, Oxford, where he graduated in 1678. In 1690 he was presented to the rectory of Sheldon, and there he wrote part of

his *Catechetical Lectures*, which brought him a wide reputation. Soon after he was selected to act as the Bishop of London's commissary in Maryland in the settlement of the church there. Not being able to start at once, he devoted himself with characteristic energy to a scheme for establishing parochial libraries in England and America, and had such success that before his death eighty had been founded in England and thirty-nine in America. Out of his library scheme grew the Society for Promoting Christian Knowledge; and he may also be regarded as the founder of the Society for the Propagation of the Gospel. About the close of 1699 he sailed for Maryland, but in 1706 returned to England to accept the living of St Botolph Without, Aldgate, where he laboured with the utmost devotion. He died 15th February 1730.

Brayera. See CUSO.

Brazenose College. See OXFORD; and for Roger Bacon's brazen head, see Greene's play of *Friar Bacon and Friar Bungay*.

Brazil, the largest state of South America, and the third largest political division of the Western Continent, has a length of 2660 miles, and a breadth of 2700 miles between extreme points. Its coastline extends from Cape Orange on the north to Rio Chuy on the south, a distance of nearly 4000 miles. It borders on every state in South America except Chile, Ecuador, and Panamá. The boundary lines with some of them were long in dispute, but all have been settled by treaties. The area of Brazil is estimated at $3\frac{1}{2}$ million sq. m., or nearly one-half of the South American continent.

Physical Features.—Brazil is a triangular-shaped country, occupying the eastern angle of the continent. It lies almost wholly within the tropics, and is still in great part unexplored and unsettled. On the north and west are the great depressions of the Amazon and Paraguay rivers, which comprise large areas of flood-plains and swamps, heavily wooded, and almost uninhabitable. The upper coast is bordered by low, alluvial bottom-lands and sandy plains, full of lakes, and in places very sterile; while the southern angle of the country is rolling *campo* land, bordered by a low sandy coast. Above its eastern angle a large area of coast-lands and neighbouring plateau is subject to periodical devastating droughts. The interior of the country, however, is a high plateau, with a general elevation of 1000 to 3000 feet, irregularly ridged by mountains and deeply cut by large rivers. The mountain ranges of the maritime system form the eastern margin of this plateau, the easternmost of which is known as the Serra do Mar. This range plays an important part in the development of Brazil, for it is a costly barrier to communication with the interior, and turns nearly all the great rivers inland to find outlets through the distant Amazon and La Plata. To the west of the maritime system the elevated tablelands of the Paraná and São Francisco make great bay-like indentations in the northern and southern margins of the mountainous area, nearly uniting about the head-waters of the latter. To the westward of these plains there is a second range, nearly parallel with the maritime system, constituting the mountains of Goyaz. To the westward of these come the great elevated plains of the Amazonian and Upper Paraguayan regions. The mountains are composed almost exclusively of uplifted strata of great geological age, gneiss and metamorphic schists, with granite and other igneous rocks. The great elevated plains are composed of horizontal strata dating from the Silurian age, profoundly modified by the deep excavations of the valleys. Brazil possesses three great river-systems

—the Amazon, La Plata, and São Francisco. The Amazon and its tributaries drain fully a half of the country. To the east of the Madeira these tributaries are tableland rivers, broken by rapids and freely navigable for comparatively short distances. West of the Madeira they are lowland rivers, sluggish, bordered by extensive flood-plains, and afford free navigation for long distances. The La Plata system drains nearly one-fifth of the country through its three branches—the Paraguay, Paraná, and Uruguay. The first of these is a lowland river, freely navigable for a long distance, while the other two are tableland rivers, full of obstructions, and without free outlets for their upper-level navigation. The São Francisco is a tableland river, flowing north-east between the Goyaz and maritime mountains, and then, breaking through the latter, south-east to the Atlantic. Its tributaries are comparatively short, and nearly disappear along the lower river in the region of slight rainfall. It is not freely navigable because of the Paulo Affonso Falls. The other coast-rivers are generally short, the longest being the Parahyba, and have but little utility for navigation. The climate of Brazil varies greatly—the lowlands of the Amazon (q.v.) and a great part of the coast being hot, humid, and unhealthy, while the tablelands and some districts of the coast swept by the trade-winds are temperate and healthy. See AMERICA.

The vegetation of Brazil is luxuriant and varied. The vast forests of the Amazon contain hundreds of species of trees, draped and festooned by climbing plants, orchids, &c. Rosewood, Brazil-wood, and others supply valuable timber; tropical fruits and other useful products are abundant. The number of animal species is also very large, but the individuals in each are comparatively few. Beasts of prey are the jaguar, puma, tiger-cat, and ocelot; other animals include monkeys, tapir, capybara, peccary, ant-eater, sloth, and boa-constrictor. Alligators, turtles, porpoises, and manatees swarm in the Amazon; parrots and humming-birds are especially numerous.

Population.—In 1872 the population of Brazil numbered 9,930,480. In 1890 the number was 14,333,915, including about 6,302,200 whites, 4,638,490 half-breeds, 2,097,425 negroes, and 1,295,800 Indians. The census of 1920 gave a population of 30,645,296, or 9·3 to the square mile. For a time land was given to settlers for one or two dollars an acre, and immigrants averaged 150,000 yearly; when this grant was discontinued in 1893 the numbers declined. Of over a million immigrants to Brazil in 1908–19, 336,696 were Portuguese, 165,709 Italians, 36,246 Germans, 10,498 French, 7730 British, and 1573 Belgians. Italian and German colonists number several millions. The African slave-trade was prohibited in 1831, but did not actually cease till 1854. In 1871 a gradual emancipation law was adopted, which declared the children born thereafter of slave mothers to be free, but obliged to serve the mother's master until the age of twenty-one years. It also provided for a fund with which to liberate slaves by purchase. The number of slaves registered in 1873 under this law was 1,540,796. The number of slaves voluntarily liberated and ransomed through private efforts was very large, and two provinces (Ceará and Amazonas) had been declared entirely free. In 1885 a second law was adopted, providing for a new registry, declaring all sexagenarians free, but with obligatory service until the age of sixty-five years, and fixing an official valuation on all slaves, to prevent further abuses of the emancipation fund. Finally, by the law of 13th May 1888, immediate and unconditional emancipation was decreed, although Brazil had been unable wholly to replace the system of slave labour. Immigrant labour was

still limited, the poorer rural population was both untrained and opposed to habits of industry, and the labour of freed slaves had hitherto been utilised only to a limited extent. Experience proved, however, that kind treatment and good pay will keep a very large percentage of the freedmen on the plantations.

The Roman Catholic was the established religion under the empire; under the republic there is no state church, and all sects are tolerated. Education is free, but not in general compulsory, and is still in a very backward condition, the great bulk of the population being illiterate. The language is Portuguese, with dialectal varieties, discussed by Vasconcellos in *O dialecto Brasileiro* (Oporto, 1883); and the literature, which dates back to the 16th century, will fall to be noticed under PORTUGAL. The *lingoa geral*, the jargon used in intercourse with the many Indian tribes, is founded on the language of the Tupi Indians.

Government.—Under the empire the government of Brazil was a constitutional monarchy whose executive governed through a cabinet of seven members—empire, finance, war, marine, justice, foreign affairs, and agriculture—and through a president in each of the twenty provinces of the empire. The executive power was vested in the emperor and his cabinet, the legislative in a General Assembly of two houses—the Senate and Chamber of Deputies—and the judicial in a council of state (advisory only), a supreme tribunal, twelve district courts, and the usual subordinate courts. At the revolution of 1889 the empire became a republic, and in 1891 the new constitution was proclaimed by a national congress convoked by the provisional government. The United States of Brazil are a federative republic, each of the old provinces forming an organised state administering its own affairs at its own expense, and having distinct administrative, legislative, and judicial bodies. The city of Rio de Janeiro, as capital, is not included in the state of the same name, but in a federal district. An area in the state of Goyaz, on the plateau between Pyrenopolis and Formosa, has been selected as the site of a future capital and federal district. Some 60,000 sq. m. acquired from Bolivia in 1902 form the territory of Acre. The federal government takes charge of national defence, public order, and federal law, as well as import duties, stamps, postal arrangements, and the issue of bank-notes. The national congress, the legislative authority, consists of a Chamber of Deputies and a Senate, which meet annually; and the president's sanction is required to new laws. No member of congress can accept any paid office except diplomatic or military; nor can he hold contracts under government. Neither deputies nor senators can be ministers of state; both are paid. Deputies, who must have been citizens of the republic for four years, are elected by the direct vote of the several states for three years, in the proportion of one to 70,000 of the population. Senators are chosen by direct vote, three for each state, and three for the federal district. They are elected for a term of nine years, one-third of the house being renewed every three years. The president, also directly elected, has supreme command of army and navy, power to declare war and make peace (within certain defined limits), appoints and dismisses ministers, and, with the assent of congress, ambassadors and the judges of the Supreme Federal Court. All male citizens of twenty-one years duly enrolled exercise the franchise, except illiterates, beggars, soldiers in service, and monastics under vows.

The army of Brazil has a peace footing of 54,000 men, besides 26,000 gendarmes. The navy is manned by 10,000 officers and men.

The revenue and expenditure of Brazil vary greatly from year to year. Most of the revenue is derived from import duties. The public debt is heavy, and the various states and municipalities are also weighed down. The milreis of 1000 reis is of the par value of 2s. 2½d.; but the actual value of the paper milreis fluctuates greatly. In 1891 it was 12½d.; in 1896, between 8d. and 10d.; in 1898, 5½d.; in 1903, about 10d.; in 1922, 1s. 4d.

Commerce and Productions.—The total value of the exports from Brazil in 1920, exclusive of specie, was £107,500,000; and of the imports, £125,000,000. The industries are almost confined to agriculture, mining, and forest products, manufactures being but slightly developed. There is some cotton-weaving, however, and other textiles, tobacco, and flour are manufactured. Stock-raising has attained some importance. Chilled and frozen beef, leather, and hides are exported. The coast fisheries have been neglected, although Brazil is a large consumer of codfish; but something is being done to remedy this. The forest products include rubber, maté, nuts, cocoa, medicinal plants, cabinet and dye woods. The lumber industry is being developed. Only a small portion of the surface is under cultivation, large tracts being mountainous or otherwise totally unproductive. Of agricultural products, coffee, chiefly from the south-east (São Paulo), occupies the first place, and furnishes from half to nine-tenths of the total exports of the whole country, and most of the world's supply. Brazil is very important also as a producer of rubber, which is shipped from Pará and Manaos. Sugar, too, ranks high, and receives special encouragement from the state. The production of cotton and tobacco is extensive: that of tapioca has nearly disappeared. Rice, maize, and many other products are easily grown, but have been overshadowed by coffee, rubber, and sugar, and to some extent discouraged by the high cost of internal transportation. The mines are important. Gold and diamonds are found in Minas Geraes, Paraná, Bahia, Goyaz, and Matto Grosso, but the annual production at present is not large. Iron ores of superior quality exist in several provinces, but there are no large mines in operation, the inferiority of Brazilian coal being a serious obstacle to the development of this important industry. Manganese is worked. Brazil is the chief source of monazite. Some petroleum and other minerals are got. The policy of levying export duties on domestic products, and very heavy import duties on foreign goods, has been accused of doing much to restrict production and commerce; but the system of protection is gaining ground, and industries have been established on the encouragement given. A land-tax would be opposed by the great landed proprietors. It should be added that the inhabitants of the southern states are broadly distinguished by their energy from the more indolent northerners. It is in the southern provinces that the numerous German colonies are mostly established.

Steam communication with Europe was opened in 1850, and telegraphic communication in 1874. There are over 40,000 miles of inland waterways. The first railway was opened in 1854; Brazil now possesses a total extension of some 18,000 miles, of which 10,000 belong to the union and 6000 to the various states. There are 55,000 miles of telegraph lines in Brazil, including 11,000 miles of submarine cables. A system of wireless stations has been installed.

History.—As early as 1480, expeditions sailed from Bristol in search of the island of Brasyllé (for the name, see BRAZIL-WOOD), rumoured to exist in the western seas; Brazil was discovered on 26th January 1500 by Vicente Yañez Pinzon, who landed

at Cape St Augustine, near Pernambuco, and then followed the coast north to the Orinoco. In the same year a Portuguese expedition to the East Indies, under Pedro Alvarez Cabral, discovered the Brazilian coast near Porto Seguro on 25th April (April 22, *Cazal*). Cabral took formal possession, and named his new discovery 'Terra da Vera Cruz.' Two Portuguese expeditions were sent out in 1501 and 1503, the first exploring the coast from 5° to 32° S. lat., and the second planting a colony and bringing back a rich cargo of Brazil-wood (q.v.), which gave a name to Portugal's new possession.

In 1530 the Portuguese government resolved upon the definite settlement of Brazil, and the plan adopted was its division into hereditary captaincies, which should be granted to private individuals, with ample powers for the founding of colonies on their own account. Many of the earliest colonies failed through lack of means, and from inability to hold their ground against the natives. In 1567 a Huguenot colony, established on the bay of Rio de Janeiro twelve years before, was overthrown by the Portuguese, who then founded the present capital of Brazil. Portugal and her colonies having become dependencies of Spain, a squadron sent out by the Dutch in 1623 to seize Brazil captured the colonial capital, Bahia. The Dutch lost the city in 1625, but in 1630 they captured Pernambuco, which, with several neighbouring places, they held for over twenty years. In 1640 Portugal regained her independence, and in 1654 her former possessions, but without any definite settlement of her boundary disputes with Spain. To strengthen her claim to the territory on the eastern shore of the La Plata, the town of Colonia, opposite Buenos Aires, was founded in 1679; this was the beginning of a bitter struggle for the present republic of Uruguay, lasting nearly 150 years, until the independence of that territory was formally recognised in 1827 by Dom Pedro I. The discovery of gold in Minas Geraes in 1693, and of diamonds in 1729, gave a new impetus to the growth of the country, one result of which was the removal of the colonial capital from Bahia to Rio de Janeiro. The cultivation of cotton, tobacco, and sugar-cane had already attained great prominence and prosperity in the northern captaincies. The colonial system of Portugal, however, was one of selfish exclusion and greedy extortion. The colony was rigidly closed to foreigners, industry was burdened by restrictions and monopolies, the taxes were farmed out, the authorities were arbitrary and grasping, the administration of justice was slow and corrupt, printing was forbidden, the people were grossly ignorant, turbulent, and immoral, and internal communication was slow and difficult. In 1808 the royal family of Portugal was expelled by the French and took refuge in Brazil, and the very first act of Dom João VI. was to open Brazilian ports to foreign commerce. He then removed various restrictions on domestic industries, founded a printing-office and library, created new courts, and opened various schools and public institutions. All these acts greatly stimulated the growth of the country. In 1821 he returned to Portugal, leaving his eldest son in Brazil as prince-regent. Personal ambition, and the advice of men opposed to government from Lisbon, led the young prince to declare for Brazilian independence, 7th September 1822. He was proclaimed and crowned emperor—as Dom Pedro I.—before the end of the year, the small Portuguese force in the country being quickly and easily expelled. The constitution was ratified and sworn to early in 1825, and some amendments were added in 1835. The new empire, however, did not start smoothly, nor was the reign of Dom Pedro I. a fortunate one. Vexed with the opposition encountered, he in 1831 voluntarily abdicated in

favour of his eldest son, and withdrew to Portugal. During the next nine years Brazil was governed by regencies, but in 1840 a popular agitation led to the declaration of the young prince's majority, at fifteen years of age, and to his coronation the following year as Dom Pedro II. The reign was one of almost unbroken peace, interrupted by two wars—one with Buenos Aires in 1852, and the other with Paraguay in 1865–70. At the revolution of November 1889 the empire became a republic, and Dom Pedro and his family were exiled. In 1893–94 a revolt led by two admirals and supported by the navy had to be suppressed. Another naval revolt in 1910 won some reforms. Brazil in 1917 entered the Great War on the side of the Entente.

See books of travel and natural history by Professor and Mrs Agassiz (1870), A. R. Wallace (1870), Bates (1873), Spruce (1908); also books by Mulhall (1877), Fletcher and Kidder, H. H. Smith (1880), Zöller (1883), Wells (1886), Fonseca and Almeida (1899), Lamberg (1899), Plane (1903), Sellin (1909), P. Walle (1912), Koebel (1919), Roosevelt (1914); and for history, the works of Southey (1810–19), Costancio, Pereira da Silva, Fialho (1891), Akers (1904), and Grossi (1905).

Brazil, a city of Indiana, 55 miles SSW. of Indianapolis, in a region producing coal, shale, and clay, has iron industries; pop. 9000.

Brazil Cabbage, CHOU CABAÏBE, are names somewhat vaguely applied to various species of *Caladium* and *Colocasia* (natural order, Araceæ), which yield edible tubers, and are largely cultivated in the tropics. See ARUM, COCCO.

Brazilian Arrowroot. See MANIOC.

Brazilian Grass, an incorrect popular name applied to a substance used in the manufacture of a very cheap kind of hats, known as Brazilian grass hats, and also as *chip* hats. It consists of strips of the leaves of a palm, *Chamerops argen-*



Brazil Nut:

a, the fruit; b, the same, with half the pericarp removed to show the nuts or seeds; c, a single nut or seed; d, a nut cut across; e, a leaf.

tea, which are imported into Britain for this manufacture, chiefly from Cuba. See CHAMEROPS.

Brazilian Plum. See HOG PLUM.

Brazil Nuts are the seeds of the *Bertholletia excelsa*, a majestic and beautiful tree belonging to the Lecythidaceæ, related to Myrtaceæ (q.v.). The tree grows to the height of 100 or 120 feet, and abounds on the banks of the Orinoco, and in the

northern parts of Brazil. It produces a round woody seed-vessel, almost as large as a man's head, within each of the four divisions of which lie six or eight of the seeds. The pericarp is very heavy and solid; and at the time when this great fruit is ready to fall it is dangerous to walk under the tree. The seeds, which are popularly called nuts, and much resemble fruits of that description, are wrinkled and triangular, having a hard shell and a pure white kernel, which, when fresh, is very agreeable. They are chiefly exported from Pará and French Guiana. They yield as much as 56 per cent. of edible oil, which is good for burning, soap-making, lubricating watches, and other purposes.

Brazil-wood, a dark-red or yellowish-brown dye-wood, which forms a considerable article of export from Brazil. It is the produce of different species of *Casalpinia* (q.v.). Much of the Brazil-wood of commerce is obtained from the heart-wood of *Casalpinia brasiliensis*, a native of the West Indies.—**PERNAMBUCO WOOD** is the produce of *C. echinata*, sometimes regarded as the Brazilian form of the preceding species. The timber is called Nicaragua-wood. The Sappan-wood (*C. Sappan*) of the East Indies has similar properties, and is described as an article of European commerce in 1193 under the name of *brasil*, *brasily*, &c. (cf. Span. *brasil*; Fr. *brésil*, for which Marco Polo has *berzi*). Thus Brazil-wood does not really owe its name to Brazil, but the country to its abundance of red dye-woods. *C. crista* probably yields some of the inferior West Indian Brazil-wood.

The colouring matter is termed *brasilin*; strong decoctions of Brazil-wood are used by the dyer and calico-printer in the fabrication of reds, browns, &c.; it is also used in the manufacture of red ink. See **INK**, and **SANDALWOOD (RED)**.

Brazing, or **SOLDERING**, is the process of uniting together two pieces of brass, two pieces of copper, or one of each, by means of a hard solder, partaking more or less of the composition and properties of ordinary *brass*. The edges or parts of metal to be joined are first filed bright, so as to be thoroughly clean, then there is strewed over the joint a mixture of the solder and borax. The solder employed varies in composition according to the kind of work, and may be rendered more fusible by the addition of a larger amount of zinc. Hard solder, or 'spelter solder,' for brass consists of 1 part of copper to 1 of zinc; for copper or iron it is usually 1 part of copper to $\frac{2}{3}$ of zinc. The proportions, however, vary, 3 of copper to 1 of zinc being about the hardest solder. After the solder is made it is again heated and granulated in a mortar for use. The borax is employed to form a glaze over the brightened surfaces, and thus prevent the oxidation of the metal, which would seriously interfere with brazing, and even stop the operation. An outward coating or layer of charcoal is likewise serviceable in the exclusion of the air during the brazing of large pieces of metal. Where a very high heat is required in the process, a little powdered glass is mixed with the borax. The mixture of solder and borax may be applied dry, but it is better to moisten it with water, and to lay it on the filed surfaces with a spoon. The whole is then gently heated, when the water evaporates and leaves a crust of borax and solder. The work may now be strongly heated by a bellows, blowpipe, or over a clear charcoal or coke fire, and at a bright red heat the solder fuses and the zinc begins to burn with a pale-blue flame. At this stage the solder *flushes* or becomes liquid enough to permeate the joint or crevice; but should it be tardy in acting thus,

several slight taps will ensure the proper result. The whole is now cooled, and, towards the close, the articles may be introduced into cold water for more rapid reduction in temperature. Pieces of metal which have undergone the process of brazing are so firmly united that they may be rolled and re-rolled without the parts yielding. Steel is brazed with a solder composed of 19 parts silver, 1 of copper, and 1 of brass. See **SOLDER**.

Brazos, formerly **BRAZOS DE DIOS**, a river of Texas, U.S., rising in a tableland called the Staked Plain, in the NW. of the state, and running 950 miles south-eastward, till it falls into the Gulf of Mexico about 40 miles SW. of Galveston. It is navigable at all times to a distance of 40 miles from its mouth, and at high-water for 250 miles.

Brazza (Croatian *Brač*), the largest of the Dalmatian islands of the Adriatic, with an area of 152 sq. m., inhabited by Croats. Its surface is mountainous and richly wooded; marble is quarried. San Pietro and Milna are the chief towns.

Brazza, **PIERRE SAVORGNAN DE** (1852-1905), a distinguished French explorer, of Italian descent, was born on board a steamer in the harbour of Rio de Janeiro. He studied at Paris, entered the French navy in 1870, and served on the Gabon station. In 1876-78 he made a famous exploration of the Ogowe, and of some of the northern tributaries of the Congo. In 1878 the French government gave him 100,000 francs for exploration and the promotion of French interests in the country north of the Congo, where he secured vast grants of land for France, and founded several stations, that called Brazzaville being on the northern shore of Stanley Pool. In 1883 he returned to extend the territory secured to France, this time with a government grant of 1,275,000 francs, besides stores and provisions of all kinds; and by the end of 1885 he had established twenty-six stations, Franceville being the chief. The securing for France of her great dependency lying between the Gabon and the Congo is mainly his work; and of that dependency he was governor from 1886 till 1897.

Breach, in a military sense, is a gap or opening in any of the defences of a fortress, effected either by mining or by the fire of guns placed in what are called 'breach-batteries.' The earthen ramparts of all fortresses are surrounded by deep ditches. In order to support the weight of the rampart, and make the ditch a more formidable obstacle, its sides are built up with retaining walls of masonry, technically called 'revetments,' often 30 feet high and 15 feet thick at the foot. To breach by mining, the explosives are lodged at the back of the revetment and near its foot under the parapet in sufficient quantities to bring down the greater part of the whole bank of earth and retaining wall. The debris falling into the ditch forms a ramp or slope, up which the assaulting party rush into the fortress. At the same time the wall retaining the far side of the ditch, called the 'counterscarp,' is treated in a similar manner to facilitate the descent into the ditch. The same result may be obtained by artillery fire. Heavy howitzers are placed in batteries at 3000 or more yards from the 'escarp' or revetment of the rampart, upon which they drop shell, crumbling it away from the top downwards, until a practical breach is made. During the Peninsular war there were some formidable examples of breaching. At Badajoz 14,000 shot brought down 180 feet of wall in 104 hours, from a distance of 450 yards. At San Sebastián 13,000 shot brought down 100 feet of wall in 62 days, from a distance of 620 yards. But deliberate breaching by guns is not now so much in vogue; heavy artillery aims at destroying

everything in the fort, and rendering it untenable without actual assault. In the Great War (1914-18) siege howitzers proved capable of complete ruin, in 100 shots, of the revetments, ramparts, gun-emplacements with overhead cupolas of steel, magazines and other concrete-roofed cover, of a very modern fort. See **CONCRETE**.

Breach is a legal term used in England and Scotland to denote the violation of a legal right or obligation. The most common form of this is Breach of Contract. A contract may be broken by simple failure to pay or to perform, or by the debtor making it impossible for him to perform before the time arrives, or by his seriously declaring that he will not perform. In some cases the creditor has a right to specific implement—i.e. an order by the court on the other party to do what he promised to do; but in most cases the remedy is an action of damages for breach of contract; and difficult questions arise as to the proper measure of damages. In an ordinary mercantile sale, for instance, if the seller fails to deliver, the buyer must go into the market within a reasonable time to supply himself. On the other hand, if the buyer breaks the contract, the seller should dispose of the goods as soon as possible, and charge the difference of market and contract price. Breach of Trust consists in the violation of the express or implied obligations of a trustee—e.g. making an investment of trust funds not sanctioned by the trust deed, or using trust funds in the business of the trustee. The liability so incurred is generally to replace the funds, sometimes with penal interest. Such acts are often restrained by interdict or injunction at the instance of the beneficiaries. Breach of trust often takes a criminal complexion, and is punished as embezzlement. Breaches of contract are very rarely criminal—indeed only where the element of conspiracy occurs. Breach of the Peace includes a great variety of criminal acts, from mobbing and rioting down to small police offences. In England, Breach of Close is a technical expression for trespass on private ground; Breach of Pound is the unlawful removal of distrained goods which have been impounded—i.e. put in the custody of the law. In Scotland, Breach of Arrestment means the disregard of the prohibition to pay or deliver, which is effected by the use of arrestment in the hands of a debtor; it involves only civil consequences—viz. the liability to pay or deliver a second time. Breach of Interdict, on the other hand, is regarded as a more serious contempt of court, and is often severely punished criminally. Breach of Prison is the escape from arrest of a person lawfully arrested for crime. See **CONTRACT**, **DAMAGES**, **TRUST**, **WARRANTY**; and for Breach of Promise of Marriage, see **MARRIAGE**. See also **BREAKING INCLOSURES**.

Breaching Tower, or **BEFFROI**, a movable tower brought near the wall of a besieged town in ancient and mediæval times. Its use is more than once spoken of by Cæsar in his account of his campaigns in Gaul. Froissart describes, with his usual spirit, a beffroi employed at the siege of the castle of Breteuil in 1356. At the siege of Jerusalem by the Crusaders, a beffroi was carried in pieces, put together just beyond bow-shot, and then pushed on wheels to a proper position. Sometimes they were pushed on by pressure, sometimes by capstans and ropes. The highest were on six or eight wheels, and had as many as twelve or fifteen stories or stages; but it was usual to limit the height to three or four stages. They were often covered with raw hides to protect them from the flames of boiling grease and oil directed against them by the besieged; and there was a

hinged drawbridge at the top to let down upon the parapet of the wall to aid in landing. The lower stage frequently had a ram (see **BATTERING-RAM**); while the others were crowded with bowmen and slingers; or there were bowmen on all the stages except the top, which had a storming or boarding party. The *locus classicus* for a description of such military engines is this from Lord Berners' *Froissart*, I. cix. 131: 'Two belfries of great timber, with iii. stages, every belfry on four great wheels, and the sides towards the town, were covered with cure boly [Fr. *cuir bouilli*] to defend them from fire and from shot; and into every stage there were 'pointed C. archers.' The engine was also called a *sow*.

Bread. The earliest and most primitive way of making bread was to soak the grain in water, subject it to pressure, and then dry it by natural or artificial heat. An improvement upon this was to pound or *bray* the grain in a mortar, or between two flat stones, before moistening and heating. A rather more elaborate bruising or grinding of the grain leads to such simple forms of bread as the *oat-cakes* of Scotland, which are prepared by moistening oatmeal (coarsely ground oats) with water containing some common salt, kneading with the hands upon a baking-board, rolling the mass into a thin sheet, and ultimately heating before a good fire, or on an iron plate called a girdle, which is suspended above the fire. In a similar manner, the barley-meal and pease-meal *bannocks* of Scotland are prepared; and in the East Indies (especially the Punjab and Afghanistan), as well as in Scotland, flour is kneaded with water, and rolled into thin sheets, as *scones* (although this term is usually applied to bread lightened with butter-milk and baking-soda.) The *passover cakes* of the Israelites were also prepared in this way. A similar preparation of wheat-flour, but where the sheet of dough is made much thicker, forms the *dampers* of Australia. The Indian corn-meal, kneaded with water and fired, affords the *corn-bread* of America. The kinds of bread referred to above are designated *unleavened*, as no leaven has been added to the dough to excite fermentation. No chemical change has therefore been produced except that the starch has been rendered more soluble by the process of baking. Even in the time of Moses, however, *leaven* was employed in making bread. It is held probable that the Egyptians were the first to use leaven; that the secret afterwards became known to the Greeks; and that the Greeks communicated the process to the Romans, who spread the invention far and wide in the northern countries during their campaigns.

A modern development in bread-making is to use flour artificially bleached by nitrogen oxide. Such flour produces a very white loaf. As to the effect on health, nothing definite can be said in the meantime. So-called 'flour improvers' are also added to flour. These consist mainly of persulphates of alkaline metals, and are all used to whiten the loaf.

The grain of wheat is generally employed in the manufacture of bread among the better classes and more advanced nations, though rye, barley, Indian corn, and rice are also extensively used. The black bread of Germany (pumpernickel) is made of coarse rye flour, and a considerable portion is indigestible.

As a general rule, to which there are exceptions, the wheat becomes more starchy as we proceed southwards. The *strongest* foreign flours (i.e. those richest in gluten) are grown in Minnesota, Manitoba, Hungary, and Russia. Indian wheat usually furnishes a *weak* flour. The principal constituents of wheat may be separated from each other without much difficulty. Thus, if wheat-

flour be placed in a cloth-bag with the mouth well closed, and the whole introduced into a basin of water, and pressed by the fingers for some time, the starch is squeezed through the cloth as a fine white powder, and the gluten is left in the cloth as a viscid or sticky substance. Again, if wheat-flour be burned on a porcelain plate on a fire, or oven, or gas-lamp, till it can burn no longer, it leaves behind a small amount of ash or saline matter.

Previous to being employed in the fabrication of bread, the grain of wheat undergoes the process of *milling*, with the double object of reducing it to a fine state of division, and separating the more hard and indigestible parts (see *MILL*). During the grinding operations, the wheat as it passes from grain to flour nearly doubles its bulk. The products come from the dressing-machine divided into different qualities, a quarter of wheat yielding by some systems of milling:

Flour, 1st and 2d qualities.....	71-86 per cent.
Bran (small and large).....	23-91 "
Germ, sweepings, light wheat, exhaust dust, &c.....	3-23 "
Waste.....	1 — "
Total	100-00

In the making of bread in Great Britain, the flours are blended by the baker so as to produce bread of the desired quality. In the making of good bread three things are absolutely requisite: flour or meal, yeast or leaven, and water containing salt. The Yeast (q.v.) or leaven is added to give a start to the Fermentation (q.v.) process, thereby supplying carbonic acid, which communicates a spongy or light texture to the bread. Leaven is the more primitive ferment, and is simply a portion of moistened flour or dough in which the putrefactive agencies have begun to work. It may be procured by allowing moistened flour to lie in a warm apartment (summer heat) for six or eight days, and when sufficiently formed, has an acid taste and reaction, and a somewhat fusty odour. When brought in contact with a new portion of flour and water, and incorporated therewith by kneading, it very quickly acts as a ferment, and develops partial fermentation in the whole. Hence it is that where leaven is used, it is customary to retain a portion of the leavened dough for the next baking. On the Continent, leaven is still very extensively employed, especially in districts far from breweries. In Britain, yeast is generally used as the ferment. There are three forms in common use—viz. 'brewers' yeast,' 'German compressed,' and 'patent.'

The materials being at hand, and the proper benches, utensils, and oven being within reach, the baker takes a quantity of water and adds to it the yeast and salt; after which the flour is added, and the whole thoroughly and laboriously kneaded together till it assumes a ropy consistence. It is then called the *sponge*, and is placed in a kneading-trough in a warm place, which is styled *setting the sponge*. In a short time, the yeast begins to act on the gluten, starch, and sugar of the flour, compelling the latter to pass into alcohol and carbonic acid gas in every part of the dough, which thereby becomes inflated with innumerable air cavities. When the fermentation has sufficiently advanced, the baker takes the sponge, adds more flour, water, and salt, a second time subjects the whole to a thorough process of kneading, and makes it into dough, after which he allows the mass to lie in a warm place for from one to two hours. The dough swells considerably from distension by gas, and is weighed out into lumps of the proper size, which are shaped into loaves, constituting the *batch*, or placed in tin pans, and allowed to lie for a short time till they get further distended. The oven has previously been heated to a

temperature of at least 450° F., which is the lowest temperature at which bread can be baked, and ranging up to 572° F.; when it has been thoroughly cleaned out, the loaves are introduced, and the oven shut up. Until recent years bakers had not improved upon the method used in the bakeries of Pompeii—viz. by burning wood in the floor of the oven itself until the proper temperature had been reached, then cleaning out and introducing the loaves. Latterly, however, this somewhat inconvenient method has been improved upon, and many large bakeries are fitted with ovens heated either by flues, gas (regenerator), or superheated steam. The heat acts in dissipating much of the water from the dough, in distending the air cavities more fully, and in partially *boiling* the starch and gluten of the dough, and developing some gum from the starch. Indeed, though the temperature of the oven is much higher, yet the loaves beyond the mere crust are bathed in an atmosphere of steam, and are never heated above 215° F., as has been proved by direct experiments with the thermometer. One effect of the heat is to arrest any further Fermentation (q.v.; see also *YEAST*). After about one and a half hours' baking in the oven, the length of time being determined by the temperature, the loaves are withdrawn, and allowed to cool. The brown appearance of the crust of loaves, and the pleasant taste of the crusts, are due to the action of the heat on the starch and the formation of Dextrin (q.v.), a sort of gum. The number of quartern (4-lb.) loaves which a sack of flour weighing 280 lb. yields, is from 86 to 96 according to the strength of the flour. It will be apparent, therefore, that as 280 lb. of flour yield on an average 360 lb. of bread, a good deal more water must be present in the latter than in the former; and, indeed, ordinary good wheaten bread contains about 45 per cent. of water. This water is retained even after the loaf is apparently dry, and even mealy, as the gum and gluten have a great affinity for water.

Machinery has now superseded manual labour in many of the operations of bread-making. In a few of the largest bakeries the flours obtained from various sources are blended by passing through a sifting-machine, and are thence conveyed by a strap or endless screw to large bins. From these bins, when Parisian barm or brewers' yeast is used, the flour is drawn off into barrels or troughs in which the sponge has to be stirred. The stirring is usually performed by means of a vertical spindle provided with horizontal blades, which is made to revolve in a barrel or trough. At the proper time the sponge is emptied into a kneading-machine, the remainder of the water and salt is added, and a quantity of flour is drawn off from the bins sufficient to make the mass of the desired consistency. The whole is now thoroughly mixed into dough. This operation is completed in from five to ten minutes in batches which will turn out from one hundred to five hundred loaves. There are several kinds of kneading-machines in the market, but the two most commonly used are the 'Thomson' and the 'Pfleiderer' machines. They consist essentially of an iron trough provided with blades revolving in opposite directions. In the 'Thomson' machine the blades revolve upon the same axis, while those of the 'Pfleiderer' revolve upon different axes. As soon as the dough is thoroughly made, it is emptied into troughs, where it remains for an hour or two. It is then conveyed to a table and weighed out, and afterwards moulded into loaves as already detailed. There have been several attempts to make machines to divide and mould the dough into loaves, but these have not yet been perfected.

The baking business is chiefly carried on in shops

of moderate dimensions, in which on an average perhaps twenty bags of flour are used per week, but in many large cities the factory system has been introduced. Some of these are on a very large scale, using 1000 to 2000 bags every week. From the nature of the industry, operations are principally carried on at night or early morning. In England till recently almost every family in the country baked its own bread, but the Scottish custom is gradually creeping in, of getting supplied by a baker from a neighbouring town.

The appearance which good wheaten bread ought to present is that of a vesicular or spongy mass, from which layers can be readily detached; and this, known to bakers as *piled bread*, is the best index of good, wholesome, and easily digested bread. When the layers cannot be detached, and the loaf cannot be crumbled down by the fingers into a coarse powder, or the fragments be thoroughly soaked and be readily diffused through water, but become a permanent tough mass of dough, the bread is imperfectly made.

Rye-bread is very extensively used in northern European countries, where the soil being sandy is admirably adapted for the growth of that grain. It yields a flour darker than wheat-flour. It is almost equal in nutritive value to wheaten bread. Barley and oats, which, when used as bread, are generally made into cakes or bannocks, possess also a composition not unlike wheat. Indian corn, which thrives luxuriantly on the American soil, and is largely used there for bread, as also to a considerable extent in the Old World, is little different from wheat in the proportion of its ingredients. Rice is occasionally employed in making bread, but it is not nearly so nutritious as wheat.

But although, with the exception of rice, the various kinds of grain do not sensibly differ in the amount of nutritious matter contained in the meal, yet there is a great difference as to the quality of yielding a light, spongy bread. In this respect the flour of wheat excels all others. This quality seems to depend upon the mechanical structure of the gluten of wheat, which gives a glutinous, sticky consistency to the dough, rendering it impervious to the carbonic acid gas formed in it during the fermentation, so that the gas thus imprisoned swells it up. The meal of other grains forms a more granular and less tenacious dough, which allows the gas to escape with more or less ease as it is formed. It is thus impossible to make a light spongy loaf of oatmeal, however finely it might be ground. In the case of whole-meal bread, or brown bread, the rough, hard particles of the bran interfere with the ordinary tenacious quality of wheaten flour, and make the dough slightly porous, so that much of the gas escapes, and thus this kind of bread is never so much raised as bread of fine flour.

Instead of raising the dough by the action of yeast, which decomposes a part of the flour and causes the loss of about 2 per cent., bicarbonate of soda and hydrochloric acid, or bicarbonate of soda and tartaric acid, are sometimes employed. The proportions by this process are 4 lb. of flour intimately mixed with 320 grains of bicarbonate of soda; to this is added a mixture of 35 ounces of water and $6\frac{1}{2}$ fluid drachms of hydrochloric acid, sp. gr. 1.16, or 320 grains of bicarbonate, and 160 grains of tartaric acid, and the whole is kneaded and placed in the oven. When the mixture is made, the acid acts on the bicarbonate of soda, forming common salt, which is left in the dough, and carbonic acid is liberated at every point, and communicates a spongy texture to the mass. This process is chiefly used in making *whole-meal bread*, as the usual fermentation process would cause too much change in the bran, and produce a bread liable

to sour by secondary fermentation. It is also employed in making 'fancy' and 'small bread.' Sesquicarbonate of ammonia is employed to some extent in the preparation of rusks, ginger-bread, and other light fancy bread; when heated, it entirely passes into gas, and thus yields a very spongy mass. *Short-bread* is prepared from flour with which butter has been incorporated.

Brown, Composition, or Whole-flour Bread is made from the ground but undressed wheat, and therefore contains the bran as well as the flour. Some years ago it was suggested that as the bran contained more nitrogenous matter than the flour, the whole meal must be more nutritious than the finer flour alone. But that opinion is now considerably modified. The great argument in favour of the use of whole-meal bread is that it contains more nitrogen than white bread. This is perfectly true, but as was pointed out by Wigner, the nitrogen of cereals exists in two forms—viz. the coagulable and the non-coagulable albuminoids, the former being those available for the purposes of nutrition, whilst the latter are almost useless for the purposes of food, consisting of alkaloids and salts of nitrogen. The fine portion of the flour was found by him to contain the nitrogen in the first condition, whilst the bran contained the comparatively useless form of nitrogen. A strong argument against the use of whole-meal bread is that the gritty particles which are present in the bran cause an unnatural irritation in the alimentary canal, and lead to a quicker evacuation of the but partially digested and absorbed food. This explains why brown bread possesses laxative properties, and why labourers fed on it consider that it makes them hungry soon again; they feel that it does not last in the stomach, and consequently think it has little nourishment in it.

The Act of 1836 prescribes that bread, except French rolls and fancy bread, must be sold by weight only; and the Factory and Workshops Act of 1878 regulates the condition of bakehouses. See also BISCUITS, CEREALS, COOKERY, DIET, DIGESTION, FOOD, MILL, WHEAT.

AERATED BREAD is prepared by a process patented by Dr Daughlish in March 1859, and was at one time very popular, but its use is now almost exclusively confined to London and district. The process consists in placing the flour in a strong inclosed iron box, and moistening it with carbonic acid water, prepared as stated under Aerated Waters (q.v.). The dough is then worked up by machinery for ten minutes or so inside the box, from which it is dropped into moulds, which form it into loaves. It is then placed in an oven, when the carbonic acid, previously introduced with the water within the dough, expands, and forms a light palatable bread. The advantages claimed for this method of working bread are: (1) There is a saving of the whole of the waste caused by fermentation, which admits of more bread being made out of a sack of flour than by the old process; (2) The process, instead of occupying eight or ten hours, is completed in half an hour; (3) The cost of machinery and gas is less than that of yeast used in the old process; (4) The dough requires no handling to knead it and form it into loaves; (5) The bread is absolutely pure—it is simply flour, water, and salt. Not having undergone the process of fermentation, however, it has not the peculiar sweet flavour that we are accustomed to in ordinary bread, and the palate soon tires of the somewhat rapid taste.

GLUTEN BREAD is a bread prepared in such a way that it contains no starch or sugar, so as to be suitable as a food for diabetic patients. The flour is made into a stiff dough with water, and

allowed to stand for a short time, usually an hour. It is then kneaded under running water so as to separate and wash away the starch. When the wash water ceases to be milky, the remaining gluten is made up into small rolls and baked.

The adulterations of bread are dealt with in the article on ADULTERATION.

Breadalbane. See CAMPBELL.

Bread-fruit Tree (*Artocarpus incisa*), a tree of the sub-order Artocarpoideæ of Moraceæ (q.v.), a native of the islands of the Pacific Ocean and of the Indian Archipelago, is one of the most important gifts of nature to the inhabitants of these regions, its fruit supplying the principal part of their food, and its inner bark a considerable part of their clothing, whilst its timber and its milky juice are also employed for economical purposes. The genus to which it belongs (Gr. *Artocarpus*, 'bread-fruit')



Bread-fruit (*Artocarpus incisa*).

is distinguished by having the male flowers in catkins, with a two-leaved perianth and one stamen; the female flowers naked; the fruit roundish, fleshy, and tuberculated. The bread-fruit tree is a rather slender tree, 40 to 50 feet high, and often rises almost half its height without a branch. It has large pinnatifid leaves, frequently 12 to 18 inches long, dark-green, and glossy. The fruit is generally oval, or nearly spherical, and about the size of a child's head, and 3 or 4 lb. in weight. It is a *sorosis*, a compound or aggregate fruit formed from numerous flowers on a common axis, and is covered with a roughish rind, which is marked with small square or lozenge-shaped divisions, corresponding to the separate fruitlets; it is at first green; when imperfectly ripened, brown; and when fully ripe, assumes a rich yellow hue. It is attached to the small branches of the tree by a short thick stalk, and hangs either singly or in clusters of two or three together. It contains a somewhat fibrous pulp, which, when ripe, becomes juicy and yellow, but has then a rotten taste. At an earlier stage, when the fruit is gathered for use, the pulp is white and mealy, and of a consistence resembling that of new bread. In a still less mature state, the fruit contains a tenacious white milk. The seedless variety is of course especially fleshy, but the seeds of the normal form are sometimes roasted like chestnuts or used as sources of starch. The common practice in the South Sea Islands is to cut each fruit into three or four pieces, and take out the core; then to place heated stones in the bottom of a hole dug in the earth; to cover them with green leaves, and upon this to place a layer of the fruit,

then stones, leaves, and fruit alternately, till the hole is nearly filled, when leaves and earth to the depth of several inches are spread over all. In rather more than half an hour, the bread-fruit is ready; 'the outsides are, in general, nicely browned, and the inner part presents a white or yellowish cellular pulpy substance, in appearance slightly resembling the crumb of a wheaten loaf.' It has little taste, but is frequently sweetish, and more resembles the plantain than bread made of wheat-flour. It is slightly astringent, and highly nutritious. Sometimes the inhabitants of a district join to make a prodigious oven—a pit 20 or 30 feet in circumference, the stones in which are heated by wood burned in it, and many hundred bread-fruits are thrown in, and cooked at once. Baked in this manner, bread-fruit will keep good for several weeks. Another mode of preserving it is by subjecting it in heaps to a slight degree of fermentation, and beating it into a kind of paste, which although rather sour, is much used when fresh bread-fruit cannot be obtained. There are numerous varieties of the bread-fruit tree in the South Sea Islands, and they ripen at different seasons. The tree produces two and sometimes three crops a year, in fact is bearing during eight or nine months of the year. In the West Indies and South America, into which it has also been introduced, the bread-fruit is valued as an ornamental tree, but has not come much into use as an ordinary article of food; various preparations of it, however, are reckoned delicacies.—The fibrous inner bark of young bread-fruit trees, beaten and prepared, is used for making a kind of cloth, which is much worn by the common people in the South Sea Islands, though inferior in softness and whiteness to that made from the paper mulberry (see MULBERRY, PAPER).—There exudes from the bark of the bread-fruit tree, when punctured, a thick mucilaginous fluid (*latex*), which hardens by exposure to the air, and is used, when boiled with cocoa-nut oil, for making the seams of canoes, pails, &c. water-tight, and as birdlime.—The timber is soft and light, of a rich yellow colour, and assumes, when exposed to air, the appearance of mahogany. It is used for canoes, housebuilding, furniture, and many other purposes. It is durable when not exposed to the weather. The leaves serve for wrapping articles of food, and the fallen male catkins furnish a convenient source of tinder.—The Jack Tree or Jaca (*A. integrifolia*) is a large and very thick tree, a native of the East Indies, but cultivated also in the Antilles, with large entire leaves and much larger fruits (up to 25 lb.), of which some varieties are as eatable as those of the commoner species. The mahogany-like timber is known as jacqueira-wood, and is used both in building and furniture. The sap yields a kind of dammar, and is also a source of caoutchouc. *A. hirsuta* (Malabar) yields paper from its bast.

Bread-nut, the fruit of *Brosimum alicastrum*, a native of Jamaica, an artocarpaceous tree closely allied to the bread-fruit. The bread-nut tree is dioecious, with ovate-lanceolate evergreen leaves, and abounds in a tenacious gummy milk. Its leaves and young shoots are much eaten by cattle, but deleterious qualities are said to be developed in them as they become old. The fruit is a one-seeded drupe, and the kernels, boiled or roasted, form an agreeable article of food, and are eaten instead of bread. Their taste resembles that of hazel-nuts.—The *Palo de Vaca*, or Cow-tree (q.v.), of Demerara is often referred to the same genus.—*B. Aubletii* of British Guiana and Trinidad yields heartwood of a rich deep mottled brown, hence called letterwood, snakewood, or leopardwood. It is chiefly used for veneering.

Bread-root. See YAM and PSORALEA.

Breadth is a term used by painters and critics to indicate that artistic quality which gives concentration, repose, and harmony of effect to a picture. In a work distinguished by breadth, the individual component parts do not force themselves unduly upon the spectator, the eye is not tempted to wander aimlessly from point to point of the canvas; in such a picture we do not feel inclined to count the several bricks of the artistic structure, but we are led to admire the general proportion and total effect of the building. Breadth of effect is most commonly and readily attained by massing the shadows, and skilfully leading the eye through the half-tones to the brilliant concentration of the highest lights; and of this mode of treatment the portraits and figure-pieces of Rembrandt are typical and unsurpassable examples. The introduction of the triangular spaces of shadow, which appear so frequently in the foreground of Waterloo's etchings, and in the landscape-work of his contemporaries, is a well-known conventional and mechanical device for securing breadth of effect. Breadth, however, may—in the hands of an accomplished painter—be attained more subtly when the greater part of the canvas is kept in full sunshine and the spaces of shadow minimised (instead of the points of light, as in the practice of Rembrandt above referred to); and of this method of attaining breadth the most perfect examples that art has yet presented are the later landscapes of Turner. The term 'breadth of handling,' or 'a broad touch,' is used to express certain characteristics of manipulation, to designate the practice of a painter who works with a full brush, and aims less at minute and searching expression of detail than at truth and beauty of general tone, effect, and relation.

Bread-tree. See KAFFIR BREAD, CYCADACEÆ.

Breaking Bulk, in Scots law, signifies making use of an article supplied in bulk, or in quantity; by which act one is said to break bulk, and is, in consequence, prevented from afterwards objecting to it, and returning it to the seller. It may be necessary to apply for judicial inspection before doing this, or at least to give notice to the carrier or to the seller. See SALE OF GOODS.

Breaking Inclosures, the technical name of an old statutory offence in Scotland, which consisted of injuring plantations, or breaking their inclosures. Special punishments were provided for the purpose of favouring planting and inclosing in the 17th century. This would now be punished as malicious mischief. See PLANTATION.

Breakspear. See ADRIAN.

Breakwater is a barrier intended for the protection of shipping in harbours or anchorages. It sometimes happens that, in front of a semi-circular bay, a small island is so situated as to form a natural breakwater. This is to some extent the case with the Isle of Wight, which occupies such a position as to protect Portsmouth and Southampton from the south. In many other places, however, bays and harbours are without such screens. A pier may be so placed and constructed as to serve also the purpose of a breakwater, but the term breakwater is generally confined to a structure used solely for protection, and not for berthing or traffic, and breakwaters are frequently insulated, so as to be cut off from any communication with the shore unless by water.

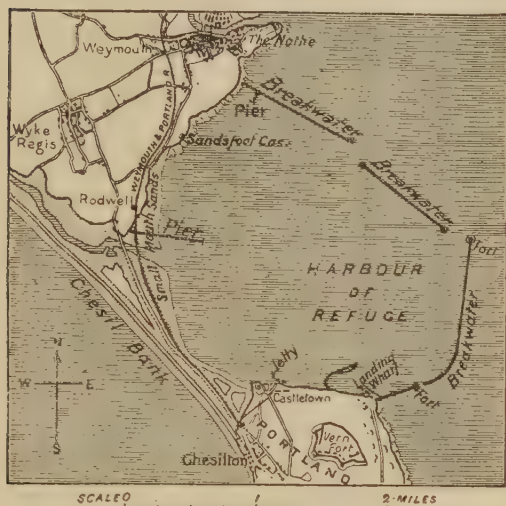
Plymouth Breakwater is the best known of these engineering works. The sound or harbour, being open to the south, was so much exposed to storms that it was determined to construct a breakwater across its mouth, with openings between it and the shore, on either side, for the ingress and egress of shipping. The works were commenced in 1812,

from designs from Rennie. The operations consisted in transporting large blocks of stone from a neighbouring quarry, shipping them in vessels fitted with trap-doors, and depositing them in the shape of a huge mound. The design was to carry the rubble mound to a height of 10 feet above low-water, with a width on top of 30 feet. As soon as the stones began to appear above water, a perceptible benefit resulted; in the calmness of the sound during the prevalence of storms; but the structure was very roughly handled by the waves, which altered and flattened its shape. A storm in November 1824 overthrew a length of 796 yards of the finished work; after this the breakwater was raised 10 feet higher, the seaward slope made 5 to 1, and the top width 45 feet, the top and slopes paved with masonry, and the top protected with expensively dressed granite blocks, joggled together and bedded with cement. It was not until 1841 that the works were finally completed, by the deposit of more than 3,000,000 tons of stone, and the expenditure of nearly £1,500,000. The breakwater is nearly a mile long. The open channels at each end, between the breakwater and the shore, are each about half a mile wide, and their depth is respectively 40 and 22 feet at low-water. The breakwater is 400 feet wide at the base, and 45 at the top—the two sides being made very sloping for the security of the stones. The water-space protected by this breakwater comprises 1120 acres, and it is generally admitted that the money has been well spent. The breakwater requires constant repair; the sum voted in some years exceeds £2500.

Holyhead Breakwater was designed by J. M. Rendel for the purpose of converting Holyhead Bay into a harbour of refuge. It is formed of stone quarried from Holyhead Mountain, the stone being run out upon a timber staging and dropped into the sea. This mode of construction was first adopted at this work, and it permits the stone being deposited in rough weather, when it would not have been safe to use barges. The rubble reached up to the level of high-water, and has assumed a seaward slope of 1 in 12. A vertical wall, 20 feet thick, is founded in the rubble at low-water level and carried up to 40 feet above that level; the width of roadway inside is 40 feet. The breakwater shelters an outer roadstead of 400 acres, with a depth of from about 20 to 50 feet, and an inner harbour of 267 acres, with a depth of 3 to 7 fathoms. The original estimate was £1,400,000. The stone for the breakwater was obtained by enormous blasts: one of the mines contained 21,000 lb. of gunpowder, which displaced 130,000 tons of stone. On Rendel's death the completion of the work was entrusted to Sir John Hawkshaw, who completed the head, which was founded by divers at a depth of 20 feet under low-water, and carries a lighthouse rising to the height of 70 feet above high-water. The cost of the breakwater was £163, 10s. per lineal foot. The work was begun in 1847 and finished in 1873.

Portland Breakwater is of very great value, in converting into a harbour of refuge the expanse of water between the Dorsetshire coast and the Isle, or rather peninsula, of Portland. An act of parliament was obtained in 1847 authorising the works, which were begun in 1849. The breakwater, starting from the north-east point of the Isle, stretches nearly due north for more than 2 miles, with one or two intervening openings for the ingress and egress of shipping. The works are of the same engineering character as Holyhead, but were conducted more easily than those of any other great breakwater; for the Isle contains an abundance of stone easily quarried, and the

steep shores afforded facility for transporting the stones by gravity. The work, finished in 1872, is for the most part a rubble stone bank, sur-

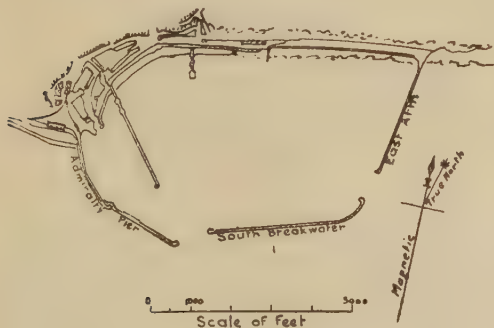


Plan of Portland Breakwaters.

mounted by vertical walls from the low-water level; the depth is about 50 feet at low-water. The new breakwater (1894-1903) extends from the north to meet the northern end of the old one, a distance of over two miles.

Batteries mounted with heavy ordnance were erected on the breakwater.

Dover Breakwater has been chiefly useful as the French mail-packet station. There is no stone near to form a mound, as in the other breakwaters spoken of, and, in consequence, the work has been brought up in solid ashlar from the bottom by the diving-bell, with the interior formed of blocks of concrete. In 1891 a bill was passed for extending the commercial harbour, and the memorial stone was laid by the Prince of Wales in 1893. The



PLAN OF ADMIRALTY HARBOUR - DOVER 1909

work included an extension of the Admiralty Pier 580 feet in length, with another new east pier, and enclosing an area of 75 acres. Works for a further extension in the form of a National Harbour of Refuge were commenced in the beginning of 1898. These consist of a further extension of the Admiralty Pier of 2000 feet, an east arm extending 3320 feet, and a breakwater 4200 feet long, at a distance of three-quarters of a mile from the shore, to form the sheltering arm of the harbour on the south. The entrances are 740 feet and 650 feet in width,

with 40 feet depth at low-water. The area enclosed, including the commercial harbour, is 685 acres; the cost was £3,500,000, and the whole was completed in 1910. In these works the breakwaters are formed of concrete blocks built as solid structures from the foundations upwards, the blocks being bonded together. The external faces are of granite incorporated into the blocks. These latter works were designed by Messrs Coode and Matthews.

Alderney Breakwater was designed for the government by James Walker in 1847. The situation is fully exposed, and the depth of water at its extremity is 130 feet. This breakwater consists of a rubble mound, with walls above founded 12 feet under low-water. The work was completed in 1864, but has been at various times seriously damaged. The total cost of the structure was £1,327,050.

Cherbourg Breakwater is the greatest and the most costly ever constructed. About 150 years ago M. de Cessart proposed to the French government the formation of a breakwater at Cherbourg, to be commenced by the construction of a number of hollow cones formed of timber-framing, sunk in a line as close as they could be placed to each other, and then filled with stones. These cones, of which there were to be 64, each about 70 feet high, 150 feet in diameter at the base, and 60 feet at the top, were intended to form a nucleus to the stone breakwater, to prevent the stones, during its formation, being knocked about and too much spread out by the action of the waves. In 1784-88 16 cones were constructed, and 13 of them sunk; but so great was the destruction which they underwent during stormy weather that the government at length abandoned the plan, and carried on the stone breakwater without the aid of the cones. It was completed under Napoleon III. at a cost exceeding £2,500,000. The breakwater itself was finished in 1853, but since that year large fortifications have been built upon the upper works. The length is nearly 2½ miles; the breakwater is 300 feet wide at the bottom, and 31 at the top. The chief mass consists of rubble or unshaped stones, thrown down from ships; but there is a larger ratio of wrought and finished masonry than in the Plymouth Breakwater, consisting of granite blocks embedded in cement. The depth of water is about 60 feet at low-water spring-tides; and the breakwater rises to 12 feet above high-water level. The water-space included within and protected by the breakwater is about 2000 acres, but two-thirds of this has scarcely depth enough for the largest-sized ships. The relation which this breakwater bears to the vast military and naval arrangements of the place will be noticed under CHERBOURG.

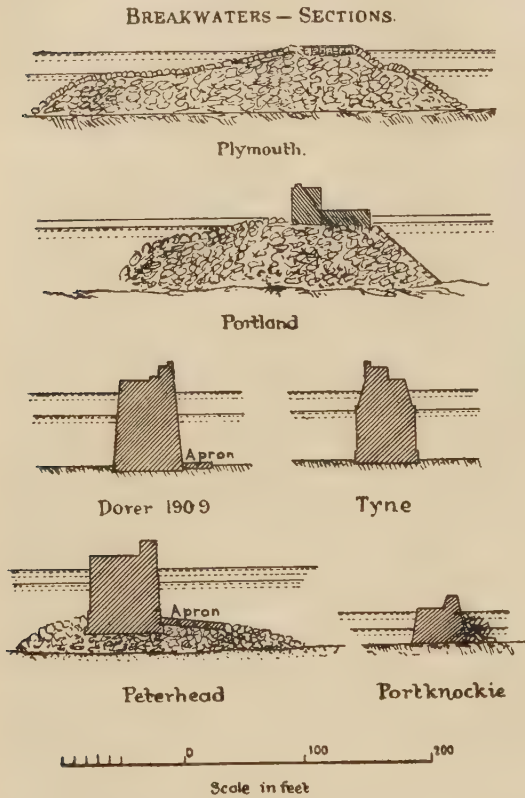
Concrete Breakwaters.—The introduction of concrete made from Portland cement has in recent years greatly modified and simplified the construction of breakwaters. The cement is mixed with sand, gravel, and broken stone in various proportions according to exposure—1 of cement to 6 of other materials being a common proportion for breakwaters. Sometimes the concrete is made into large blocks on shore and deposited under low-water. On the other hand, it may be lowered down, enclosed in large bags; or it may be lowered down in boxes, with hinged bottoms, and deposited in mass on the bottom, within timber or metal casing. The Portknockie Breakwater owes its strength to being a monolith of concrete made in this way. The south breakwater of Aberdeen is formed on large blocks from the bottom up to 4 feet above low-water, and above that level of concrete in mass formed within temporary casing. The Colombo Breakwater is composed of a mound of

rubble brought up to 24 feet under low-water, and above that level of concrete blocks weighing 35 tons each set on edge. Sometimes breakwaters are made by first depositing large concrete blocks of 20 to 50

professor in the Collège de France 1864–1905, and died 25th November 1915.

Bream, a popular name applied to three very different kinds of fish, but especially to the first mentioned. (1) The Fresh-water Bream (*Abramis brama*), a common little fish nearly allied to the Bleak (q.v.). It has an elongated, laterally compressed body, a short blunt snout, and long anal fins. The colour varies from silver-gray to brown. It may measure over a foot, and usually weighs between two and four pounds, though often more. The bream is frequent in north Europe, including England, the south of Scotland, and Ireland, and swims in great shoals, in quiet waters. It is shy, hardy, and prolific, and feeds on water-weeds, small animals, and organic matter in the mud. At the breeding-time the males become adorned with numerous whitish knobs, which become amber-coloured; as many as four are said to follow the spawning female. The flesh is eaten, especially on the Continent. The White Bream (*Blicca bjoernka*) occurs in England in eastward rivers from Yorkshire to Suffolk. The flesh is of poor quality.

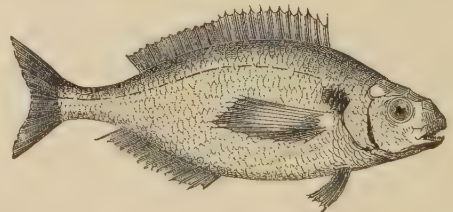
(2) Quite distinct from these is the large family of Sea-breams or *Sparidae*, in the Acanthopterygii division of bony fishes. They have compressed oblong bodies, one dorsal fin, with approximately equal soft and spinous portions, with the lower rays of the pectorals usually branched, with thoracic ventrals. They are especially characterised, however, by the nature of their dentition. Anterior cutting teeth, or lateral molars, or both, sometimes plus anterior conical canines, are present, and the palate is usually toothless. The family is a large one, with 30 genera and about 160 species, occurring abundantly along the coasts of tropical and temperate seas. They feed on flesh or algae, and are for the most part fit for eating. The solitary Black Sea-bream or Old Wife (*Cantharus lineatus*), the Common Sea-bream (*Pagellus centrodontus*), caught in great numbers with the seine net, the Mediterranean Gilthead (*Chrysophrys aurata*), and many others, occur on southern British coasts. The Australian Black Bream is *Chrysophrys australis*; the Red Bream is merely a



tons in weight, in *pierres perdues* style from the bottom up to a little above low-water, and then forming a monolithic mass of concrete above, such as the breakwater at St Jean de Luz. The breakwater in Peterhead Bay (part of the great harbour of refuge, begun in 1886) is somewhat in the Colombo style, and is being made by aid of convict labour. The north breakwater will be 1000 feet long when finished. The southern arm, which is completed, is about 3250 feet, and the area enclosed will be 285 acres. The largest blocks weigh 52 tons. The breakwater at Fraserburgh, begun in 1878 and finished in 1882, is constructed of Portland cement concrete; the lower portion is formed of fifty-ton bags dropped from a barge. The result at Aberdeen has not been favourable to the bag-work system for exposed situations, serious damage having been sustained by the works. The bag-work has had to be protected at some parts by large concrete blocks deposited in front of them.

Many substitutes have been proposed for solid breakwaters, such as floating breakwaters constructed of timber framework, open iron screens, &c., but none of them have been shown to be suitable for actual practice. Close timber-work, filled in with stones, is found to be quite efficacious; but on most of our coasts the timber is liable to be eaten by the marine worm, which is an almost insuperable objection to its being used under water. See HARBOUR.

Bréal, MICHEL JULES ALFRED, French comparative philologist and mythologist, born at Landau, in Rhenish Bavaria, 26th March 1832, was



Common Sea-bream (*Pagellus centrodontus*).

young Schnapper (q.v.). (3) *Bramaraii* (see BRAMA), of the mackerel family, is also called Bream.

Breastplate, in ancient armour, was a plate of iron, steel, or other metal, so fastened as to protect the chest of the wearer. The backplate protected him from attack from behind. The two together form what is now called the *cuirass*, worn by the *cuirassiers* of European armies, and by the household cavalry (Life-guards and Horse-guards) in England. See ARMOUR.

Breasts, or mammary glands, are the organs which secrete milk for the nourishment of the young in the Mammalia, and from the presence of which that class of animals takes its name. In the human subject they are two in number, situated on the front of the chest. In very exceptional cases additional glands are found, sometimes in remote situations. In children they are small and rudi-

mentary, but about the age of puberty they enlarge. In boys this enlargement, if it occurs, passes off after a few days, and the breasts remain rudimentary during the rest of life; but in girls it leads to the full development of the organ. Over the centre of the gland there is a circular patch of skin, thinner and darker than the rest (the *areola*); and from it rises a small conical projection (the *nipple*). On the apex of the nipple the *milk-ducts* (15 to 20 in number) open by separate orifices. Each of these ducts passes outwards to one division or *lobe* of the breast, dilating beyond the nipple into a *sinus*, and



Breast, showing the lower half dissected, during the period of lactation (from Luschka).

then branching repeatedly to terminate in the *lobules*, or clusters of small rounded vesicles in which the milk is secreted. The lobules and lobes are bound together by connective tissue, and well packed in fat, which increases sometimes to an enormous extent the apparent size of the organ.

In the adult female the breasts swell a little at each monthly period. During pregnancy considerable enlargement takes place, and shortly after the birth of the child the milk begins to be freely secreted.

DISEASES OF THE BREAST are of frequent occurrence in women, probably on account of the great changes in activity and blood-supply to which the organ is subject.

Fissures of Nipple.—During suckling the delicate skin of the nipple often becomes abraded. The ulcers or fissures thus formed are usually very painful, so much so it may be as to render nursing impossible, and frequently lead to abscess of the breast. Their formation may usually be prevented by applying to the nipple several times daily a spirit lotion—e.g. diluted eau-de-Cologne or brandy—or an astringent—e.g. glycerine of tannic acid—both before and after nursing is begun, and by scrupulous attention to cleanliness. When they have formed, similar measures may be used; or oxide of zinc, starch, or some other drying powder, frequently applied. If severe or persistent, the use of lunar caustic may be necessary.

Acute Inflammation and Abscess.—Acute inflammation of a part of the breast or of the adjacent tissues frequently occurs during nursing, rarely at other times. In its treatment, besides measures generally useful in inflammation, the free application of belladonna in the form of plasters or liniment is of special value; and care must be taken that the milk is not allowed unduly to accumulate in the organ. When abscesses result, they should be opened with antiseptic precautions; but they are often very tedious and intractable.

Chronic Inflammation of the whole or a part of

the breast sometimes occurs, and may closely resemble a true tumour. It may disappear under the prolonged application of warmth and moisture, or other remedies which favour absorption, or may end in abscess.

Tumours.—The breast may be the seat of almost any of the numerous forms of Tumour (q.v.) met with in the body. Far the most common varieties in this situation, however, are *glandular tumours* and *hard cancer*. Glandular tumours (adenoma) vary much in size, form, and consistence, but present in their intimate structure more or less resemblance to the normal structure of the breast, and are not dangerous to life. Their removal may be necessary on account of the pain or inconvenience they cause the patient. Cancer (q.v.), on the other hand, is all but invariably fatal if left alone, and the whole gland affected with it should be removed at once as soon as the nature of the case is recognised. Unfortunately, however, the disease frequently returns. It is most important that any lump in the breast, not obviously inflammatory, should at once be shown to a medical man, though in some cases it may be hardly possible, even for the most practised, to decide at once its nature. Here it must suffice to say that cancer of the breast very rarely begins before the age of thirty; in a woman younger than this, therefore, a tumour is not likely to be of a serious nature.

The male breast is occasionally, but very rarely, the seat of disease.

Breastwork, in Fortification, is a hastily constructed earthwork of sufficient height to protect men standing on the natural surface of the ground, and firing over it without requiring a 'banquette' to stand upon, as would be the case with the more carefully constructed work called a 'parapet.' The ditch in front, from which the earth is taken to form the breastwork, affords a slight additional obstacle to the attack. The inner surface of a breastwork is revetted (that is, faced with sods, timber, hurdles, &c.), in order that it may stand at a steep slope, thus improving the cover it gives by enabling the defenders to get close up to it. In this respect it differs from the still simpler work called an *Épaulement*.

Breath and Breathing. See RESPIRATION.

Breath, OFFENSIVE, may depend upon some cause limited to the mouth or nose, or it may arise from diseased conditions of the respiratory or digestive apparatus. If, from want of proper attention, the teeth have collected a quantity of putrescent particles around them, they must be well scrubbed with a brush and tepid water, with some powdered carbonate of magnesia mixed with it. A wash composed of a teaspoonful of tincture of myrrh or of Condyl's fluid in a pint of water is also very useful. Occasionally, the secretion from the Tonsils (q.v.) is very offensive; and then a solution of iodine 5 grains, potassium iodide 10 grains, and peppermint oil 3 drops to an ounce of glycerine should be applied to them every morning with a camel-hair brush. Solutions of soda in water are also very useful. Should the fetid smell arise from a portion of dead bone, the latter must be removed when it becomes loose. Inhalation of steam from hot water into which some creosote has been dropped is much recommended for cases in which the cause resides in the nose and respiratory passages. When, however, it is caused by digestive derangements, the treatment should consist in purging to empty the intestinal canal, followed by soda to correct acidity, and tonics, of which the bitter infusions and tinctures, and the dilute mineral acids, are among the best.

Medical treatment is of little use to correct the foul odour which rises from the stomach of the

habitual drunkard, or from the victim of gangrene or abscess in the lungs. See also OZÆNA.

Breccia, a term adopted from the Italian to designate a mass composed of angular fragments of rocks of the same or different kinds, cemented together by an enveloping paste, as, for example, by infiltrated oxide of iron or carbonate of lime. Bones and fragments of bones cemented together by calcareous matter often occur upon the floors of caves in limestone; these are termed *bone-breccia*.

Brechin, a town of Forfarshire, on the left bank of the South Esk, $8\frac{1}{2}$ miles W. of Montrose. Pop. 8000. With Montrose, Arbroath, Forfar, and Bervie, it returns one member to parliament. Linen and paper are the leading manufactures; bleaching, distilling, and brewing being also carried on. David I. founded a bishopric here about 1150. Part of the cathedral, late First and Second Pointed in style, is now the parish church, at whose south-west angle rises a Round Tower (q.v.), similar to the Irish ones, and to the one at Abernethy, the only other example in Scotland, unless the tower of the ancient church of Egilshay in Orkney be reckoned a third. Dating probably from about 983, it is surmounted by a 15th-century conical roof of 25 feet. Brechin Castle, the ancient seat of the Maules, now represented by the Earls of Dalhousie, was taken by Edward I. in 1303 after a twenty days' siege. The town itself was burned by Montrose in 1645; and near it Huntly defeated the rebellious Crawfords in 1452. Dr Thomas Guthrie was a native.

Brechou, one of the Channel Islands, W. of Sark; area, 74 acres.

Breckinridge, JOHN CABELL, vice-president of the United States, was born 21st January 1821, near Lexington, Kentucky, where he practised law until 1847, when he was chosen major of a volunteer regiment for the Mexican war. He sat in congress 1851-55, and in 1856 was elected vice-president, with Buchanan as president. In 1860 he was the pro-slavery candidate for the presidency, but was defeated by Lincoln. A United States senator from March to December 1861, he then entered the Confederate army, was appointed a major-general in 1862, and held some important commands during the civil war. He was secretary of war in Jefferson Davis's cabinet at the close of the struggle, and escaped to Europe, but returned in 1868. He died at Lexington, 17th May 1875.

Brecknock, or BRECON, the capital of Brecknockshire, is situated in an open valley in the middle of the county, at the confluence of the Usk and Honddu, 183 miles W. by N. of London by rail, and 40 NE. of Swansea. It lies in the midst of fine mountain scenery, and has beautiful public walks, the triple-peaked Brecon Beacons (2910 feet) rising to the south. From 1536 to 1885 Brecon returned one member to parliament. Flannels, coarse woollens, and hats are manufactured. Population, about 6000. Bernard de Newmarch founded the town, and built a castle there in 1094. Henry VIII. in 1541 converted a Dominican friary into a college, which was rebuilt in 1864; the priory, now the parish church, was restored by Sir Gilbert Scott in 1862. The county-hall was built in 1843. Mrs Siddons and Charles Kemble were natives.

Brecknockshire, or BRECON, an inland county of South Wales, to the south of Radnorshire, from which it is separated by the Wye. The maximum length is 39 miles; its breadth ranges between $11\frac{1}{2}$ and 30 miles; and its area is 733 sq. m., of which hardly half is cultivated. Brecknockshire is one of the most mountainous counties in South Wales, and has deep, beautiful, and fertile valleys. Two principal mountain-chains, the highest in South Wales, culminating in the

Brecon Beacons at a height of 2910 feet, intersect the county in the north and south, and occupy, with their offshoots, a great part of the surface. The Old Red Sandstone occupies the south and middle of the county, and Silurian rocks the north. The chief rivers are the Wye and Usk; and Llangorse Lake covers nearly 1800 acres. The climate is moist but healthy among the mountains, and in the valleys comparatively mild. Birmingham, Cardiff, Swansea, and Merthyr-Tydfil derive most of their water-supply from Brecknockshire. Agriculture, though still defective, especially in the higher districts, has been greatly improved by the Brecknockshire Agricultural Society, instituted in 1775. The chief crops are oats and barley, but wheat is also grown in Talgarth and Crickhowell, the most fertile districts of the county. The small native cattle are reared in the hills, while in the lowlands the Hereford breed predominates. The mineral produce is small, consisting of iron, especially along the south border; coal and limestone are also found in the south and west. The Brecon Canal connects the county with the Bristol Channel, and many railways have been constructed throughout the county. There are small factories of woollens and worsted hosiery; also important iron-works, but the ore is chiefly obtained from adjoining counties. Brecknockshire, in combination (since 1918) with Radnor, returns one member to parliament. Pop. (1801) 32,325; (1871) 61,627; (1911) 59,287; (1921) 61,257. The chief towns are Brecon (the county town), Brynmawr, Builth, Crickhowell, Hay, and Llanwrtyd. There are many remains of British and Roman camps, Roman roads, cairns, menhirs, Ogham inscriptions, mounds, and castles throughout the county. Brecknockshire formed part of the territory of the Silures, who bravely withstood the Romans. The Normans, under Bernard de Newmarch, wrested the county from the Welsh princes in 1092. Llewelyn, the last British prince of Wales, was killed at Llanafanfechan, near Builth, in 1282, and by his fall the native mountain-chiefs were entirely subdued. Welsh is still the language of the middle-class and the peasantry. See Jones's *History of Brecknockshire* (1805-9; new ed. 1898).

Breda, a town of North Brabant, Holland, at the confluence of the navigable Mark and Aa, 52 miles ENE. of Flushing, and 30 NNE. of Antwerp. It formerly possessed the means of laying the surrounding country under water in the event of an attack, but the importance of the town as a military position has passed away, and in 1876 the fortifications were removed. Its Gothic cathedral (1510) has an octagonal steeple 311 feet high, and several interesting monuments; whilst the castle (1350) received its present shape from William III. (1696), and in 1828 was converted into a military academy. There are manufactures of carpets, linen, hats, soap, furniture, &c., and dye-works, breweries, and rope-walks. Pop. 30,000. Breda is celebrated as the place where, in 1566, the protest of the Dutch nobles, known as the 'Compromise of Breda,' against the measures of Philip II. of Spain in the Netherlands, was presented and rejected. The 'Declaration of Breda' (April 1660) was Charles II.'s manifesto prior to the Restoration; whilst by the 'Treaty of Breda' (1667) between England, France, Holland, and Denmark, England got St Christopher, Antigua, and Montserrat, and France Acadia. Breda has suffered numerous sieges, having been captured by the Spaniards (1581), by the Dutch under Maurice of Orange (1590), by Spinola (1625), again by the Dutch (1632), and twice by the French (1793-95), who were finally driven out in 1813.

Brederode, HENRY, COUNT OF, born in

Brussels in December 1531, was a leader of the disaffected nobility in the struggle against Spain. He drew up the 'Compromise' of 1566, and headed the deputation to whom the name Gueux (q.v.) was first applied. He was active in organising the fraternity, but the failure of an attempt, in the following year, to raise an armed revolt in Amsterdam obliged him to flee to Germany, where he died at Recklinghausen, 24th August 1568.

Bree, MATTHIAS IGNATIUS VAN, a Flemish painter, was born at Antwerp in 1773, and in 1797 gained the *prix de Rome* by his 'Death of Cato.' In 1804 he returned to Antwerp, where he became director of the Academy of Fine Arts, and died 15th December 1839. His chief works are the 'Entrance of Napoleon into Antwerp,' the 'Death of Rubens,' in the Antwerp Museum, and the 'Patriotism of the Burgomaster at the Siege of Leyden, 1576,' in the town-house of Leyden.—His brother, PHILIPP JACOB VAN BREE (1786–1871), also acquired some reputation as an historical painter.

Breeches, Trousers, and Hose are the most general terms for a garment of many forms, which in most of Europe has been worn mainly by males, but among some northern and eastern peoples by women also. *Hose* is still familiar from the phrase 'doublet and hose' (signifying male attire), and from such compounds as trunk-hose (a kind of breeches reaching to mid-thigh, puffed and slashed and otherwise ornamented, which in the 16th century was worn with long stockings). Originally meaning perhaps a stocking, the word hose came to be applied to combined breeches and stockings, and when these were separated again (as in trunk-hose) it could be used of either 'overstocks' or 'netherstocks,' but in course of time came in English to be restricted to the latter, while in German it followed the opposite course, and has become the ordinary word for trousers. *Breeches* and *trousers* stand broadly for two types of garment not clearly or consistently distinguished, breeches being generally used of such as come short of the knee or reach only a little way below it, trousers of the longer kinds. Though the predominance of the latter fashion has determined that the exotic word trousers should now be the more familiar, yet in symbolical use—betokening maleness or domination, or the change from nudity to the wearing of clothes—where the distinction is irrelevant, and the expression often traditional, the native English word still prevails. According to Wyclif, Adam and Eve 'maden hem brechis,' and the Geneva Bible of 1560 takes its name of Breeches Bible from its use of the same word. One might cite Wyntoun on Noah's household: 'among thame al was not ane breke;' or David Lyndesay: 'made them brekis of levis grene;' but to this day in the Scottish dialect breeks (the northern form of breeches) retains its general sense. The word is a double plural. In Old English the singular must have been *brēc*, with plural *brēc* (cf. *tóth, tēth, gós, gēs*; 'tooth,' 'teeth,' 'goose,' 'geese'). The original plural came to be regarded as a singular, and a new plural was formed from it. *Treus* or *trouse*, on the other hand, now felt to be a plural, was originally a singular, derived apparently not from French *trousse*, but from Irish *triubhas* (*New English Dictionary*). Its plural *trousers* survives only as a vulgarism, except in the disguised form *trousers*. *Hose* likewise is felt as a plural—'On ilka leg a ho had he' (James Hogg).

Trousers were to the Greeks and to the Romans (of republican times) a mark of barbarism, worn by most of their neighbours to north and east—Celts, Germans, Dacians, Sarmatians, Phrygians,

Parthians, Persians, and others. *Gallia Narbonensis* was distinguished as *Gallia braccata* (breeched Gaul, from a Celtic word apparently cognate with the Germanic) from *Gallia togata* (Cisalpine Gaul), which had abandoned the garb of old Gaul for the Roman toga. The close-fitting hose of the middle ages call for no particular notice, but from the trunk-hose days the overstock takes many forms. One may note the baggy Dutch slop, the fantastic pluderhose of the lanzknechts, the loose, wide petticoat-breeches of Charles II., the culottes or knee-breeches which the French Revolutionists rejected in favour of the tight pantaloons—a Venetian garment reaching the ankle, whose name survives in the American and vulgar *pants*.

Breech-loading is the introduction of the charge into a firearm at the breech instead of at the muzzle. A description of the systems used in the case of rifles will be found in the article with that heading, and in this one the systems used with cannon and sporting guns will only be dealt with.

Efforts to provide a practical system of breech-loading are almost contemporaneous with the introduction of cannon, and some account of these will be found in the article on Firearms, and it will be seen that in early days breech-loading was the rule rather than the exception; but with the improvements in gunpowder and the desire to obtain greater ranges, the attendant rise in pressures rendered so intolerable the escape of gas round the imperfectly machined spigot and faucet joint secured by a wedge that we hear nothing of breech-loading in heavy guns after about 1550, and though the practice lingered on in the small 1-pr. and 2-pr. guns, it dropped entirely out of use in the 17th century, and there is no record of any practical use of it for cannon until the middle of the 19th century, when the adoption of rifling in small arms and the successful introduction of breech-loading in the 'Needle-gun' reopened the question, while the immense improvements in methods of manufacture rendered a solution of the problem of successful 'obturation' (gas-sealing) more feasible.

The first fairly satisfactory system was proposed by Captain Cavalli, an officer of the artillery of Piedmont, in 1845, and was first tried in Sweden. Guns loading on this system were used at the siege of Gaeta in 1860. It is shown in figs. 1, 2, 3, and 4. A is a wedge; B is a copper split-ring (figs. 1 and 4); C a saucer-shaped disc of iron fitting inside (B) and against the face of the wedge (figs. 1 and 3). On firing, the circumference of the saucer expanded against the walls of the chamber of the gun, as also did the copper ring (B). The difficulty with such an action would be the liability of jamming of the wedge after firing, while the danger of its being blown out, since it is only secured by friction, would also be considerable. Further, the working would be slow, as the disc (C) had to be removed and introduced separately between rounds by means of the handle (D, fig. 2), which was screwed into the hole shown in its rear face. The system was tried in England in 1850, but was unfavourably reported upon. It has, however, some of the essential features of the Krupp wedge mechanism described hereafter.

The next system was that of Baron Wahrendorf,

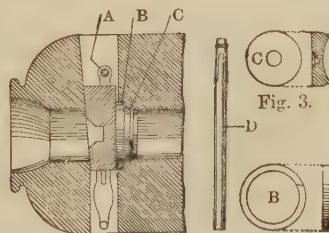


Fig. 1.

Fig. 2. Fig. 4.

a Swede, which was actually adopted by Prussia for some of her guns in 1860. It appears in figs. 5 and 6. A (fig. 5) is the cup-shaped obturator, forming one piece with the ring (B) and rod (C), the latter terminating in the screw-handle with washer (D). The obturator with its ring and rod are borne by a carrier (E) attached to the rear end of the gun by the hinge (F). G (fig. 6) is an iron cylindrical block capable of passing through the ring (B). When the breech is to be closed, the obturator is pushed into the gun as far as it will

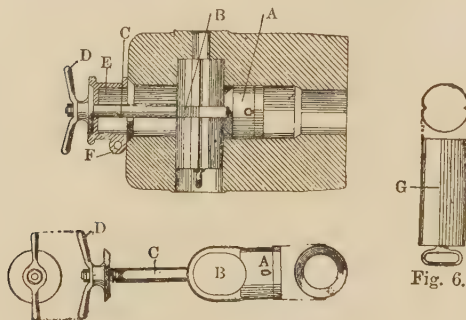


Fig. 5.

go, the block (G) is pushed through the hole (B) into its seating in the gun, and the handle (D) is screwed up tight, which has the effect of making the obturator (A) fit firmly against the block (G). The fit between the obturator and the walls of the chamber is a good one, and the gas-escape is sealed by the expansion of the cup. To open the breech, the handle (D) is unscrewed, the block (G) withdrawn, and the obturator pulled through the carrier (E) until only the obturator head (A) rests in it; the carrier with obturator in it is then swung open on the hinge (F). The obturation of this system was not perfect, and had to be supplemented by a cup-shaped wad of compressed paper on the rear of the cartridge.

The Krupp breech mechanism has undergone many improvements. In its earliest form it was somewhat similar to the Cavalli, except that there was not a separate obturating arrangement, and that provision was made for easy extraction of the wedge by means of a lever permanently attached to it, and for the prevention of the possibility of the wedge being blown out by the use of a locking-bolt. Fig. 7 shows one of the later forms for a field-gun. The rear face of this wedge is rounded, and when the wedge is pushed home the final locking, which also causes a slight forward movement, is performed by the handle (A) working the screw (B). The latter gears over a portion of its thread into the body of the gun. A stop prevents the block, when withdrawn from being pulled right out of the gun. In heavy

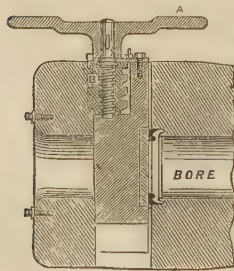


Fig. 7.—Section of Krupp Breech.

guns the withdrawal and insertion is performed by a screw with a very quick pitch. Obturation is effected by a Broadwell expanding ring, which is seated, as shown, in a recess at the end of the bore. The weak feature of the Krupp system is that with high gas pressures really efficient obturation can only be obtained by using a brass cartridge-

case, and such a case is employed in all modern Krupp guns up to the very largest, which of course greatly adds to the expense and weight of the cartridge. For the smaller quick-firing guns (see CANNON), however, the Krupp system is very well suited.

The Armstrong system, adopted for a few years by Great Britain, from 1859 (see CANNON), is shown in fig. 8. The 'vent-piece' (a) is held in its place by the hollow 'breech-screw' (c) through which the gun is loaded, the lever (b) being used to

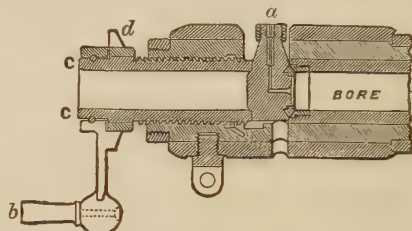


Fig. 8.—Armstrong Breech.

screw it up. This lever, it will be noticed, swings loose on the end of the screw, being kept in place by two pins travelling in the groove shown. Projecting into its path is the lug (d), which is attached to the screw. Consequently, not only can the lever be used for screwing up, but by drawing it back a sharp blow can be given against the lug (d) to perform the final tightening. The system, which did fairly in small guns, is very cumbersome when a heavy vent-piece had to be lifted out after every round. As a result, an arrangement for side opening was introduced, by which the vent-piece slid on to a tray, but at this period breech-loading was temporarily abandoned for muzzle-loading.

The breech-loading system, adopted by Great Britain in 1882 and at present in use, is a French invention, and dates from 1866, when France adopted the *interrupted screw*. This consists (see figs. 9 and 10) of a solid steel block, furnished with

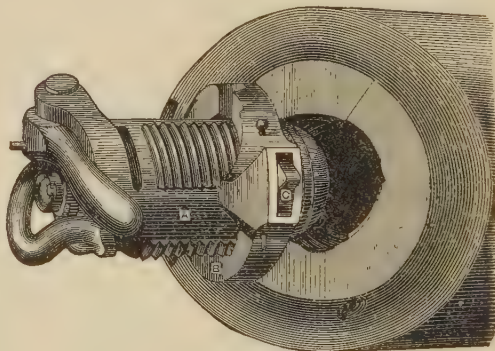


Fig. 9.—Elevation of Breech (open).

a screw-thread of the requisite pitch and strength, fitting into a similar female screw in the gun. The surface of the block is divided longitudinally into six or eight equal parts, and the screw-thread is 'interrupted'—i.e. planed away from alternate portions (see A, fig. 9). In the gun the parts of the thread corresponding with the smooth portions on the block are left intact, and those between them slotted away. Consequently, when the threaded and slotted parts on the block are brought opposite to the slotted and threaded parts in the gun, the block can be pushed right home into the gun, and then, by a turn through one-sixth or one-eighth of a circle (according to the

number of interruptions), the two can be locked together. When unlocked, the screw is pulled through the carrier (B), which is hinged to the gun, and then swung clear of the breech. In fig. 9 the screw has been only partially swung clear. While the screw is being pulled through the carrier, and until it is sufficiently withdrawn, the carrier is held against the breech by the catch (C).

The obturation in use is that invented by Colonel De Bange, and adopted by the French army about 1878. It consists (see fig. 10) of a *pad* (A) made of an annular canvas bag strengthened by wire woven into the fabric, filled with asbestos

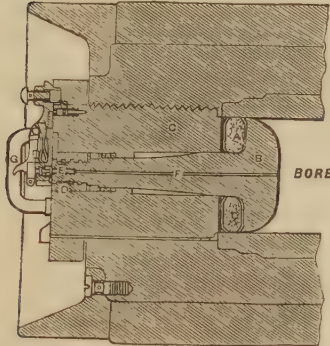


Fig. 10.—Section showing Obturator.

worked up with mutton fat, and faced with protecting discs of steel in front and in rear. The bag and discs are threaded on the stalk of the mushroom head (B), and lie between it and the face of the breech-screw (C). The stalk of the mushroom is secured in the breech-screw by the slide-box (D).

When the gun fires the gases press on the face of the mushroom head and compress the obturator, causing it to expand sideways and press against the walls of the chamber, and so prevent escape of gas. This it does in an extraordinarily efficient manner, whether in the heaviest or lightest guns. There are many modifications of the interrupted screw system, and in heavy guns the turning of the breech-screw is performed by hydraulic or other power, but the root principle is the same in all.

In all modern guns the arrangement for firing the charge is by a hole through the breech-screw or wedge, in the mouth of which is inserted and held the *tube* (see CARTRIDGE), by which the cartridge is fired, either by percussion or electrically by a suitable *lock*. In fig. 10 the tube chamber (E) and channel (F) are shown in the stalk and head of the mushroom; and on the rear face of the breech-screw there is a percussion lock (G). Suitable arrangements are provided in all modern mechanisms whereby the gun is prevented from being fired before the breech is properly closed.

If, as in quick-firing guns, a brass cartridge-case be used, obturators, as described above, are not required, but, on the other hand, arrangements for extraction are needed, as in Rifles (q.v.).

Breech-loading Sporting Guns are made on a totally different principle, called the drop-down action. Nearly every maker has a patent for different details, but almost all are founded on the Lefauchaux action, invented in 1825. This consists of a piece of steel called the 'lump,' securely fastened to the under-side of the breech end of the barrels, and about 2 or 2½ inches long; the fore end of this lump is hinged by means of a pin to the corresponding part of the breech-piece (d, e, f, fig. 11) at d, and on this hinge the barrels are moved in opening and shutting the breech. The lump is, in most guns, cut into two divisions, e, which fit into slots in the breech-piece, and both parts have notches, into which an ingenious arrangement, called, from the inventor, a 'Purdey' bolt, snaps when shut. An additional grip to add solidity is also generally provided in various forms of an extension of the top rib, b. The modern breech-

loading sporting gun is generally made hammerless—i.e. without outside hammers, but the locks, which are let into slots in the breech-piece, are usually made, more or less, on the old principle. A main-spring, on the pull of the trigger, explodes the cap in the rear end of the cartridge by means of a hammer, either acting directly through a hole in the breech (as in the Anson and Deeley lock), or by means of a detached rod inserted in the hole. Fig. 11 represents one of the many first-class breech-actions, Greener's self-acting ejector gun. A movement of the top lever, a, to the right, simultaneously slides the cross bolt from the hole in the extension top rib, b, withdraws the double Purdey bolt from the lump, and the barrels tilt over. Swivels attached to either side of the rear end of the lump cock the hammers ready for firing again; a lever at the same time ejects the used cartridge-case. The figure shows the gun as opened after firing the right barrel, from which the cartridge-case, g, is being ejected. When the breech is closed, all the bolts snap into their places. There is a safety arrangement on the side of the gun, acting on the trigger, and another automatically obstructing the fall of the hammer, which prevent



Fig. 11.—Greener's Self-acting Ejector Gun.

the gun being accidentally discharged. Double-barrelled sporting rifles also have drop-down actions, but for single barrels the bolt action, as in military weapons, is now usually employed (see RIFLE). See GUN; also J. H. Walsh's ('Stonehenge') *Modern Sportsmen's Gun and Rifle* (1882-84); W. W. Greener's *Gun and its Development* (1881), and his *Modern Shot Guns* (1888).

Breed, a distinctive group of animals which has been evolved, under human control or selection, out of a domesticated 'race,' or, in rare cases, out of a wild species. Thus we speak of the Aberdeen-Angus breed of cattle, the Clydesdale breed of horses, the Cheviot breed of sheep, the Skye terrier breed of dogs, the fantail breed of pigeons; and there is no reason why the term should not be applied to cultivated plants, for the idea implied is simply that man has interfered with the natural possibilities of pairing or mating. For practical purposes 'breeds' and 'sub-breeds' are the results of the analysis or splitting-up of a domesticated 'race' (arising from a wild species or from several wild species), but the experimental zoologist may produce 'breeds' of beetles and the like which no one would dream of calling domesticated. Darwin distinguished between 'artificial breeds' and 'natural breeds,' but the term 'natural breed' is a contradiction in terms; it simply denotes a variety or sub-species arising in natural conditions.

Origin of Breeds.—The origin of domesticated races is wrapped in obscurity. The process had not begun in the early Stone Age, and even at the

beginning of the Bronze Age it had not progressed far. Sometimes the domesticated forms seem to have been derived from a single wild species—e.g. poultry from the Indian jungle fowl (*Gallus bankiva*)—and sometimes from several wild species, as in the case of horses. In a general way it may be said that breeds have arisen from a domesticated race by germinal or congenital variations which man made the subject of selection, pairing similar variants together, preventing random crossing, eliminating undesirable 'weeds,' and so on. But beyond this, there is still very little that is certain as to the origin of any breed. A few propositions may be stated. (a) The old idea that a breed may arise by the transmission of the results of modifications impressed upon individuals is not at present supported by convincing evidence. (b) There are some experimental facts which suggest that long-continued environmental and nurlural conditions may stimulate the germ-cells and induce germinal variations. (c) There is evidence that some breeds have arisen from crosses or hybrids. Thus the Suffolk breed of sheep is believed to have arisen from a cross between the hornless Southdown breed and the black-faced horned Norfolk breed. (d) A breed may arise by the dropping out of some ancestral character, such as horns or a tail, and there are several opportunities in the history of the germ-cells which admit of the possibility of some loss of constituent items in the hereditary equipment. (e) A breed may arise from a mutation or discontinuous variation which seems to be positively new, but the conditions of these new departures are unknown. Variability or mutability has to be accepted as a fact of life. Some of the novelties that have arisen are more or less abnormal or pathological, such as mawchamp sheep, pug-dogs, waltzing mice, and tumbler pigeons; in some cases they could not have survived in nature. Thus Darwin refers to hairless and almost toothless dogs, and to Polish fowls with their vision impeded by their great top-knots. A very striking case is that of some very short-faced pigeons whose unhatched young cannot reach and break the shell, and would die inside the egg if man did not come to their aid.

As Darwin showed in his *Variation of Plants and Animals under Domestication*, the characters of breeds and sub-breeds may have to do with any part or quality of the organism—size, shape, proportions, colour, the skin and its outgrowths, the muscles, the connective tissue, the skeleton, the nervous system, the alimentary canal, and so on, besides hardness, age of maturation, reproductivity, tendency to fatten, docility, and so on. The varieties of domestic animals that are seen at shows of different kinds illustrate the range of man's breeding experiments, but it should be carefully noticed that man can only operate on the variations which occur. He can eliminate or foster, he can combine excellencies, he can breed out an undesirable quality or graft on one that pleases him, but he cannot in any way create. In spite of popular impressions, it is variation that leads; the breeder can only follow. Another misapprehension may be corrected, namely this, that a breed which is uniformly treated in a particular way—e.g. as regards nutrition and exercise—may exhibit features which are not really part of the heritable constitution, being modifications impressed on successive generations of individuals.

Practical Breeding.—If a profitable variation crops up and survives, the breeder will seek to multiply the variant. If there are several similar individuals he will breed them together, and this close inbreeding may strengthen the new character. If he has to pair his novelty with a member of the original stock, the hybrid progeny may all take after the novelty (the new feature in such cases being called a dominant Mendelian character), and

subsequent inbreeding of the hybrids may yield a definite proportion of progeny of the novelty type. Thus a new breed may be established. When the breeder pairs his novelty with a member of the original stock, the result may be progeny all resembling the original stock. But even then he need not at once conclude that the desired new character has disappeared, for, if these hybrids all resembling the parent stock be inbred, their progeny may show a small proportion of the novelty type (the new feature in such cases being called a recessive Mendelian character). It may be, however, that the offspring of two similar new variants paired together are all like the original stock, and that the result of inbreeding them yields nothing else. The same may be true when the new variant is paired with the original stock. Then all that one can say is that the new variation has disappeared as mysteriously as it came. In some cases it is possible that pairing the variant with some other variant may result in the rehabilitation of (or reversion to) an ancestral type from which both have been derived. In other cases the result of pairing the new variation with the original stock may be a blend of the old qualities and the new. There remains considerable validity in the old principles of breeding—e.g. that breeding in-and-in makes a stock stable, that undesirable types should be persistently eliminated, that the best (relatively to a given end) should be paired with the best, that good stock should not be endangered by admixture with poor stock; but the theory of breeding has been fundamentally altered by the discovery of Mendelian inheritance, which must be taken account of in the future development of the art. See HEREDITY, DOMESTICATION, CANARY, CATTLE, CELL, DOG, EVOLUTION, FOWL, HORSE, HYBRID, PIGEON, SHEEP, VARIATION, &c.

See Darwin, *Variation of Plants and Animals under Domestication* (2 vols., London, 1868); W. Bateson, *Mendel's Principles of Heredity* (Cambridge, 1909) and *Problems of Genetics* (London, 1913); James Wilson, *The Principles of Stock-breeding* (London, 1912); De Candolle, *Origin of Cultivated Plants* (London, 1884); L. H. Bailey, *Plant-breeding* (New York and London, 1904); Walter Heape, *The Breeding Industry, its Value to the Country, and its Needs* (Cambridge, 1906); A. D. Darbishire, *Breeding and the Mendelian Discovery* (London, 1911); W. E. Castle, *Heredity in relation to Evolution and Animal-breeding* (New York, 1911); Robert Wallace, *Farm Live Stock of Great Britain* (4th ed., Edinburgh, 1907); C. Keller, *Naturgeschichte der Haustiere* (Berlin, 1905); H. Settegast, *Die Tierzucht* (5th ed. 2 vols., Breslau).

Breede, a river of the Cape of Good Hope, rises in the Warm-Bokkeveld, and flows chiefly in a south-east direction through the district of Swellendam, entering the Indian Ocean at St Sebastian's Bay, about 60 miles NE. of Cape Agulhas. It drains a very fertile district, and is used for irrigation purposes. Port Beaufort, at its mouth, is blocked by a sand-bar, but the river is navigable for some miles.

Breeze. See BOT, CLEG.

Bregenz, capital of Vorarlberg, is picturesquely situated on the east shore of the Lake of Constance, 5 miles SE. of Lindau. The opening of the Arlberg Railway (1884) increased its importance. The ancient *Brigantium*, it was an important Roman station, and was for several centuries one of the chief fortified places in southern Germany. During the Thirty Years' War, the Swedes in 1646 stormed and captured the fortress. Pop. 10,000.

Brehm, ALFRED EDMUND, naturalist, was born 2d February 1829, at Renthendorf, in Thuringia, and was son of the pastor there, Christian Ludwig Brehm (1787-1864), a great ornithologist. Young Brehm travelled five years in Africa, then went to

Jena and Vienna to study natural science. He subsequently travelled in Spain, Norway, Lapland, Siberia, and Turkestan, became keeper of the Hamburg Zoological Garden in 1863, in 1867 founded the Berlin Aquarium, and died in his native place, 11th November 1884. His *magnum opus* is the *Illustriertes Thierleben* (1863; re-edited by Otto zur Strassen and others, 1911 *et seq.*). From *North Pole to Equator* has been translated into English (1896).

Brehon Laws, the name given by the English to the system of jurisprudence which prevailed among the native Irish from an early period till towards the middle of the 17th century. The *breitheamhuin* (pronounced *brei-hoo-in* or *brehon*), from whom the laws have received their name, are supposed to have been hereditary judges, who administered justice among the members of their tribe seated in the open air, upon a few sods, on a hill or rising ground. The poet Spenser in his *View of the State of Ireland*, written in 1596, describes the Brehon Laws; but Spenser was ignorant that pecuniary compensation for manslaughter had obtained in the ancient laws as well of England as of most European nations. He was mistaken, too, in believing that the Brehon Laws were an unwritten code. Among numerous portions of manuscript collections of the Brehon Laws still existing in public and private libraries may be mentioned those of the Royal Irish Academy, Trinity College, Dublin, the British Museum, and the Bodleian. These manuscripts are regarded as varying in date from the early part of the 14th to the close of the 16th century. For the laws themselves a much higher antiquity is claimed. Portions of them are referred to in compilations of the 10th century, and it may be, as has been suggested, that the redaction of them in their present form was due to Cormac Mac Cuilleain (killed 903 A.D.), king and archbishop of Cashel, a man of great learning and energy; but of this there is no actual record. The recension of the code, known as the *Seanchus Mor*, is traditionally ascribed to St Patrick (5th century), who is said to have expunged from the laws all institutions savouring of heathenism; and here again we are met with references to written laws dating from the reign of Cormac Mac Art (3d century). The language in which the Brehon Laws are composed is Ancient Irish, and though in general intelligible enough, it is sometimes rendered obscure by technical and obsolete legal terms, of which the exact meaning is uncertain.

The form of society presupposed by the laws is such as is known to have existed in Ireland in the earliest historic times. The basis of it is the tribe, and the principal occupation is the pasturage of cattle or the tillage of the soil. The whole community is arranged in a graded system of monarchs, provincial kings, chiefs, proprietors, clansmen, and serfs of an alien race. The land seems to have been divided into two parts, one as common pasture ground, the other portioned out among the chiefs and other tribal dignitaries, with the poorer clansmen and serfs holding as tenants under a proprietor. The use of coined money is apparently unknown, as fines and valuations are represented in terms of so many head of cattle.

Every part of life comes within the range of the law; there are regulations for the fostering of the children of the nobles, for their food and education, for their dress and its quality, along with ordinances regulating the holding of courts and the giving of evidence. And in the midst of all this, there survive the remains of a pagan past not yet eradicated by Christianity, such as the laws of marriage and magical ordeals. In 1852 a Royal Commission was appointed 'to

direct, superintend, and carry into effect the transcription and translation of the ancient laws of Ireland, and the preparation of the same for publication.' The commissioners intrusted the transcription and translation of the Brehon Laws to the two most eminent Irish scholars—Dr John O'Donovan, professor of Celtic in the Queen's College at Belfast, and Eugene O'Curry, professor of Irish Archaeology in the Roman Catholic university of Ireland. The work, completed under various editors, comprises, with glossary, six volumes (1865–1901), and is called *The Ancient Laws and Institutes of Ireland*. Along with the Irish text, an English translation is given, accompanied with preliminary dissertations and indexes, and they give a vivid and characteristic picture of the polity and social life of a Celtic people.

Breisach, ALT, a town of Baden, situated on an isolated basalt hill (804 feet) on the right side of the Rhine, 14 miles W. of Freiburg. The *Mons Brisiacus* of Cæsar, it was taken by Ariovistus when he invaded Gaul; being regarded as the key to the west of Germany, it figured prominently in the wars of the 17th and 18th centuries. The minster is a 13th-century structure. Pop. 3500.—Neu Breisach, on the other side of the Rhine, in Alsace, was built by Louis XIV. in 1697, when Alt Breisach was given back to the empire.

Breisgau, a district of Baden extending along the right bank of the Rhine, from Strasburg to Basel, embracing the southern Black Forest. The chief town is Freiburg.

Breitenfeld, a village of Saxony, 5 miles N. of Leipzig, remarkable for three battles fought in its neighbourhood. In the first, fought on the 17th September (old style, 7th) 1631, Gustavus Adolphus inflicted a decisive defeat upon the imperialists under Tilly, who, as well as his generals, Pappenheim and Fürstenberg, was wounded. The second battle was also a victory of the Swedes under Torstenson over the imperial forces under the Archduke Leopold and Piccolomini, 2d November (old style, 23d October) 1642. The third battle was one act of the great 'Battle of the Nations' at Leipzig, 16th October 1813.

Breitmann, HANS. See LELAND (CHARLES GODFREY).

Bremen, one of the three free cities and states of Germany, is situated on and near the estuary of the Weser. The state—area, 99 sq. m.; pop. (1919) 311,287—comprises three pieces of territory, viz. Bremen city (and environs); Vegesack, adjoining it, lower down the Weser; and Bremerhaven (q.v.), at its mouth. Bremen city lies 34 miles SSE. of Bremerhaven, and 63 miles NW. of Hanover. Pop. (1875) 102,177; (1890) 124,955; (1919) 258,612, mostly Protestants. Bremen is divided into the Old and the New Town—the former on the right, the latter (dating from 1620) on the left, bank of the river, which is spanned by four bridges. The ramparts and bastions round the old town have been levelled and formed into public promenades, laid out with excellent taste. The cathedral (1043–70; reconstructed 13th to 17th century; restored in 1888), the Church of our Lady, St Ansgar's, the beautiful Gothic town-hall (1409), with its famous Ratskeller, the 'Schütting' or merchants' hall (1537), the Gewerbehaus (guildhall), the exchange, the museum, the post-office, and the observatory of Dr Olbers are outstanding buildings. Bremen has delightful pleasure-grounds, and is in many respects a model city. With its excellent railways and waterways, it is an exceedingly thriving port, the centre of a great transit traffic, and now ranks second in Germany for foreign trade. At one time all large vessels had to stop at Bremerhaven; but a comprehensive scheme for the deepening of the

river-bed, carried out at enormous cost since 1885, has enabled ships of 5000 tons to enter its docks. Bremen is the headquarters of several big steamship companies, including the North German Lloyd (founded 1857). In commercial relations with all parts of the world, especially the United States, Bremen enormously expanded her trade during the second half of the 19th century, and rose to be the leading port in the world for the import of tobacco and rice, the leading port on the Continent for the import of cotton and indigo, while for wool and petroleum it ran Antwerp and Hamburg close. Other imports are coal, grain, nuts, dye-woods, iron, copper, asphalt, phosphates, coffee, jute, oil seeds and cake, wine, sugar. There is a big lumber trade. Large quantities of tobacco, cotton, &c. are re-exported. Exports include woollen goods, linens, glass, rags, machinery, mineral salts, colours, and toys. There are manufactures of woollens and cottons, cigars, paper, rope; and breweries, distilleries, rice-mills, jute-mills, oil and sugar refineries, extensive shipbuilding yards and engineering works. Bremen, which is well supplied with floating docks, tidal basins, and all the equipment of a great modern port, has also a huge passenger traffic, and is the chief emigration port in Germany (239,564 emigrants embarked here in 1913).

Bremen first became of historical note in the 8th century, when it was erected into a bishopric by Charlemagne. It soon attained considerable commercial importance, and became one of the principal cities of the Hanseatic League (q.v.). It frequently suffered at the hands of the French, and was in 1810 incorporated with the French Empire, but recovered its independence in 1813, and by the Congress of Vienna was admitted in 1815 as one of the Hanse towns into the Germanic confederation. Oldenburg rivalry was defeated, and a new era of expansion was opened up by the acquisition of Bremerhaven by Burgomaster Smidt in 1827. In 1867 it became a member of the North German confederation, and now it forms a state of the German federal republic. In 1884 it agreed to a surrender of its privileges as a free port, to take effect from 1st October 1888; but certain docks and warehouses of later construction (the *Freihafen Gebiet*), as well as the Bremerhaven docks, are excepted from this arrangement. The government, republican in form, was till 1918 entrusted to a senate of 16 members, two of whom were chosen burgomasters, and to a municipal council of 150 burgesses. These were then superseded by a Workers' and Soldiers' Council; and in 1919-20 a new constitution was adopted. The citizens elect the Bürgerschaft (120 members), and the Bürgerschaft elects a senate (18) as executive. Two bürgermeister are chosen from the senate. See Wilson King's *German Free Cities* (1914).

Bremer, FREDRIKA, a well-known Swedish novelist, was born at Tuorla near Åbo, in Finland, 17th August 1801; and was brought up at Årsta, not far from Stockholm. At seventeen she was taken for her health on a tour through Germany, Switzerland, and France. Soon after, the poetry of Schiller set her young imagination aglow, and the restlessness of her temperament drove her to writing—the only outlet for her energy that was open to her. In 1828 appeared the first volume of her *Sketches of Everyday Life*, but the second volume, *The H. Family* (1833; Eng. trans. 1844), first revealed her power. From this time she devoted herself to writing stories that quickly became popular in translations far beyond the bounds of Sweden, and she varied her literary labour by long journeys in Italy, England, the United States, Greece, Palestine, which supplied the materials for her *Homes of the New World* (1853) and *Life in the Old World* (1862), full of

fine descriptions of scenery and vivid pictures of social life, with sound views on political and moral questions. The admirable translations of Mary Howitt had preceded her in America as well as England, and ensured her an equally warm welcome on both sides of the Atlantic. On her return to Sweden she gave herself up to philanthropy, but more particularly to the education and emancipation of women, and the consequent propagandist character of her later novels, *Hertha* and *Father and Daughter* (1859), was detrimental in no small degree to their literary value. Her religious views she set forth in her *Morning Watches* (1842). She spent her last years at Årsta, and died there 31st December 1865. Her *Life and Letters* were edited by her sister in 1868, and were at once translated into English and German. She has been called, and not inaptly, the Jane Austen of Sweden. She resembled the English novelist in delicacy, shrewdness, and love of quiet domestic incident, but fell far short of that subtlety in simplicity which is the secret of her charm, and that marvellous insight into women, if not men, on which depends her power. Of Miss Bremer's stories perhaps the most perfect is *The Neighbours* (1837; Eng. 1844). *The Diary, The President's Daughters, Brothers and Sisters, Strife and Peace, and Scenes in Dalecarlia* are only less popular.

Bremerhaven, the seaport of Bremen state, on the east shore of the Weser estuary, 39 miles NNW. of Bremen (q.v.). It was founded by Bremen in 1827 on ground acquired from Hanover, and prospered rapidly. A second dock was opened in 1866, a third in 1874 (extended in 1899). Bremerhaven virtually forms one city with the Prussian towns of Lehe, to the north, and Geestemünde, to the south, being connected with the latter by a drawbridge across the Geeste. A well-equipped port, with dry-docks, repair-yards, &c. (including those of the North German Lloyd), Bremerhaven has a *Freihafen*, and is entirely absorbed in shipping and commerce. Pop. (1850) 3500; (1910) 24,165; (1919) 22,382.

Brendan, St., of Clonfert, born at Tralee in 484, studied under St Jarlath of Tuam, and was ordained by Bishop Erc. His name is memorable chiefly for his voyages in search of 'the mysterious land far from human ken.' After seven years' fruitless wandering he returned, but once more, in a ship of wood instead of hides, set sail with sixty friends, and at length after many wanderings reached 'that paradise amid the waves of the sea.' Brendan founded a monastery at what is now Clonfert, and died in 577 in the ninety-fourth year of his age. His festival is on the 16th of May. The *Navigation of St Brendan* was a very popular book in western Europe as early as the 11th century, but the two voyages were compressed into one, and many other adventures added. In maps before Columbus's day, 'St Brendan's country' is placed to the south of the island of Antilia and west of the Cape Verde Islands. See O'Donoghue's *Brendeniana* (1894), and Lord Bute in the *Scottish Review* for 1893.

Brenner Pass, a pass in the Central Tyrol Alps, on the road between Innsbruck and Botzen. It is the lowest pass which crosses the main chain of the Alps, the summit being only 4500 feet above the level of the sea. Lofty mountains rise above it, but the scenery is less sublime and less interesting than that of any other of the great passes of the Alps. It is open at all seasons of the year. At the summit of the pass the traveller finds in close contiguity the Eisach, a small stream, which, after growing to be a considerable river, joins the Adige, and the Sill, a tributary of the Inn; the

one stream flowing to the Adriatic, and the other into the Black Sea. In 1867 a railway through the pass was opened, and thus a complete line of railway communication was established between Germany and Italy. This work was begun by the Austrian government when Venetia belonged to the Austrian empire. The distance from Innsbruck to Botzen in a direct line is only 52 miles, but frequent windings extend the railway to 78 miles. It passes over numerous viaducts and bridges, and through twenty-seven tunnels, one of which has a length of 935 yards. This line is still the shortest route between the eastern half of Germany and Italy. There has been a carriage road over the pass since 1772.

Brennus, the Latinised form of a Celtic royal title.—(1) The leader of the Senonian Gauls who, in 390 B.C., crossed the Apennines and overthrew on the banks of the Allia (q.v.) the Roman army. On their entry into Rome the Gauls found that most of the inhabitants had fled save the senators, who, with pathetic heroism, had resolved not to survive the destruction of their homes. Clothed in their robes of dignity or office, and sitting in their curule chairs, they waited the approach of their enemies, and received their death in majestic silence. Brennus plundered the city and besieged the capitol for six months, during which time occurred the famous night-attack, which would have been successful had not the cackling of the geese in Juno's temple awakened the garrison. The Romans were at length compelled to treat with the besiegers. They offered a thousand pounds of gold for their ransom, which was agreed to. To counterpoise the gold, Brennus flung his sword into the opposite scale, crying as he did so, *Vae victis* ('woe to the vanquished'). But Camillus, who had been recalled from banishment and appointed dictator, appeared with his soldiers in the nick of time, at once set on the enemy, and after a desperate struggle cut them off to a man. According to Polybius the Gauls returned home in safety with their booty.—(2) The Gallic chief who invaded Greece, 279 B.C., at the head of 150,000 foot and 20,000 horse. After desolating Macedonia, he forced his way through Thessaly to Thermopylae, and hurried on to Delphi with a view to plunder. The Delphians bravely resisted, and aided by an earthquake and a terrible storm, besides the supernatural help of Apollo, they utterly routed the Gauls, who fled in dismay. Brennus was taken prisoner, and drank himself to death in his despair.

Brenta (*Medoacus Major*), a river of North Italy, issuing from a small lake in the Tyrol, and flowing 120 miles southward and eastward through the Venetian territory, till it falls into the Gulf of Venice at the haven of Brondolo. The old bed of the river was made use of as a canal, which forms the chief communication by water between Venice and Padua; while the Brenta is but little used for navigation.

Brentano, KLEMENS, romanticist, the brother of Goethe's 'Bettina,' was born at Ehrenbreitstein, 8th September 1778. Save for the six years (1818–24) he passed with the 'Nun of Dülmen,' recording her revelations, he led a restless, unsettled life, and showed plain signs of derangement some years before his death at Aschaffenburg on 28th July 1842. In his earliest poems the peculiarities of the Romantic school of his time are carried to excess. His dramatic productions, the best of which is *Die Gründung Prags*, are characterised by great dramatic power, amusing though rather far-fetched wit, and a wonderful flow of humour. Brentano was most successful in his smaller novels, particularly in the *Geschichte vom braven Kaspar*. His

collected works fill 9 vols. (1852–55), and there is a good selection by Diel (1873), who also wrote his *Life* (1878). See also ARNIM, LUDWIG VON.

Brentano, LUJO, political economist, was born at Aschaffenburg, in Bavaria, 18th December 1844. He studied at Dublin, and at four German universities; and after attaining a post in the royal statistical seminary in Berlin, went to England to study the condition of the working-classes, and especially trades' associations and unions. The outcome of this was his work *On the History and Development of English Guilds* (Lond. 1870); *Die Arbeitergilden der Gegenwart* (2 vols. Leip. 1871–72). He has been professor at Breslau (1873), Strasburg, Vienna, Leipzig, Munich (1891–1917). He supports the 'Socialists of the chair' (*Kathedersozialisten*) against the German free-trade school, and has written works on wages (1877), labour in relation to land (1877), and compulsory insurance for workmen (1881), the English Chartists, free-trade and protection, German trade policy and industrial organisation (1908), and Malthusianism (1909).

Brentford, the county town of Middlesex, 10 miles W. of Paddington station, at the influx of the Brent to the Thames, which is crossed here by a bridge leading to Kew. Consisting chiefly of one long irregular street, it has figured in literature, not always creditably. Falstaff disguises himself as a 'fat woman of Brentford.' Buckingham, Cowper, and others allude to its 'two kings.' Thomson calls it 'a town of mud;' Gay has spoken of its 'dirty streets;' and its modern condition is not irreproachable. It has gin-distilleries, a brewery, sawmills, a soap-work, the Grand Junction Waterworks, the terminus of the Grand Junction Canal, and railway docks. There are many market-gardens in the vicinity. Here Edmund Ironside defeated the Danes in 1016, after expelling them from London; in 1558 six martyrs were burned at the stake; and in 1642 the Royalists under Rupert defeated the Parliamentarians under Colonel Hollis. Pop. 17,000.

Brent Goose, or BRENT BARNACLE (*Bernicla brenta*), a species of wild goose, breeding in the far north, coming south in winter in great numbers, and often shot along British and other coasts. It is common in markets. The head, neck, long wing-feathers, and tail are black, the belly white, the rest slaty-gray. It is often called the black goose. It lives on marine plants and small animals. There are twelve other species—e.g. *B. leucopsis* and *B. ruficollis*. See BARNACLE GOOSE, GOOSE.

Brentwood, an urban district in Essex, 10 miles SW. of Chelmsford by rail, stands on an eminence in a well-wooded country. It has a richly endowed grammar-school, founded by Sir Anthony Browne, Chief-justice of England, in 1567. There are remains of an old chapel, dedicated in 1221 to St Thomas à Becket. Pop. 7000.

Brenz, JOHANN, the Reformer of Württemberg, was born 24th June 1499, at Weil, in Swabia, and went in his thirteenth year to study at Heidelberg. From Luther's visit to Heidelberg in 1518 he became his zealous adherent, and after his appointment as a preacher in the imperial free city of Hall, in Swabia (1522), he openly attached himself to the Reformation. He was at the Marburg Disputation in 1529, and the Diet of Augsburg in 1530, and in 1536 was summoned by Duke Ulrich of Württemberg to lead the Reformation there. For his energetic opposition to the Interim of Charles V. he was forced to flee to Stuttgart, where in 1553 he became 'propst' (or superintendent), and died 11th September 1570. Brenz was co-author of the Württemberg Confession of Faith, and his Catechism (1551) has held the next place to that of Luther in Protestant Germany. Eight

volumes of his collected works were published in 1576-90. See his biography by Hartmann (1862).

Brescia, a city of Italy, in Lombardy, 51 miles E. of Milan by rail. It is romantically situated on the rivers Mella and Garza, in a wide fertile plain, at the foot of the Brescian Alps. On a hill-top is an old castle formerly known as the Falcon of Lombardy. The city is for the most part regularly built, with many fountains, and besides two cathedrals—the old (dating from the 7th century), and the new (1604-1825)—it has numerous ancient churches, and the Martinengo Gallery (town property), with pictures and frescoes, including many by Moretto (q.v.) and masters of the Venetian school. The old Broletto Palace dates from the 12th century, the Municipio from 1492. A valuable public library, the *Biblioteca Queriniana*, was founded and nobly endowed in 1750 by Cardinal Querini; it contains many rare manuscripts. The Temple of Hercules, built by Vespasian, and excavated in 1822, forms a repository for classical antiquities. A statue of Arnold (q.v.) of Brescia was unveiled in 1882. Brescia manufactures woollens, silk, linen, iron-ware, arms, cutlery, &c., and its wine is of good quality. Brescia, whose old name was *Brixia*, was a town of the Cenomani, and its inhabitants were allied with the Romans when Hannibal crossed the Alps. It was captured by the Huns, and passed through the hands of Lombards, Charlemagne, the Franks, the Germans, and was taken by the French under Gaston de Foix in 1512. The republic of Venice held it till its own downfall in 1797. In March 1849 Brescia, as the only important town opposed to Austrian rule in Lombardy, was besieged by Haynau, and forced to capitulate. The city and province (area, 1800 sq. m.; pop. 600,000) were incorporated with the kingdom of Italy after the war of 1859. Pop. (commune), 83,000.

Breslau, the capital of German Silesia, 150 miles SE. of Frankfort-on-the-Oder by rail, is situated at the confluence of the Ohle and Oder, which divides it into two parts, connected by numerous handsome bridges. The fortifications were converted in 1813 into beautiful promenades, and the ditch has been transformed into an ornamental sheet of water. The newer streets are spacious and regular, the houses stately and handsome, in pleasant contrast to the sombre, massive structures of the old town. Educational institutions are numerous, including a university founded by the Emperor Leopold I. in 1702. Besides a cathedral (1148-1680; restored 1875), Breslau has many churches, the most remarkable being the Protestant church dedicated to St Elizabeth, with a steeple 298 feet in height, and a splendid organ; a Jewish synagogue; and a bishop's palace. The other buildings include the Rathaus, the former royal palace, now used as government buildings, exchange, and court-house. Breslau has many hospitals and charitable institutions. Its position in the centre of the manufacturing and mining districts of Silesia secures it a large trade, which its railway connection with all the important cities on every side, and the facilities of communication which the Oder affords, enable it to turn to the best account. Its linen fairs and wool-mart were renowned of old. It has manufactures of textiles, machinery, railway material, furniture, musical instruments, earthenware, carpets, sugar, &c., with many distilleries; and a trade in corn, coal, metals, timber, hemp, and flax. Breslau (Polish *Wrocław*, Czech *Vratislav*) is a city of Slavonic origin, and was for many centuries occupied alternately by the Poles and the Bohemians. It afterwards passed to Austria, from which it was taken by Frederick II. of Prussia in 1741. Sixteen years

afterwards it was captured by the Austrians after a bloody battle, but retaken by Frederick in about a month. From that time until 1814 it was frequently besieged. Breslau is of high military importance. Pop. (1870) 207,997; (1890) 335,186; (1910) 514,765; (1919) 528,200 (three-fifths Protestants).

Bressay, one of the Shetland Islands, separated from Lerwick by Bressay Sound. It is 6 miles long, 1 to 3 miles in breadth, and 10½ sq. m. in area. The prevailing rocks are Old Red Sandstone. Flag and roofing stones are quarried for exportation. The coast is rocky, there are several caverns, and the highest point is 724 feet above sea-level. Pop. 600, most of them fishermen. Bressay Sound is one of the finest natural harbours in the world, and is a rendezvous for fishing-boats. In its west centre is the harbour of Lerwick with lighthouse. East of Bressay, and separated from it by a narrow and dangerous sound, is a rocky isle, called Noss, 6 miles in circuit, girt on all sides by perpendicular cliffs, and rising abruptly from the sea to the height of nearly 600 feet, with a flattish top. A detached rock or holm, on the south-east side, in former years communicated with Noss by means of a small cradle run on strong ropes.

Bresse, a district in eastern France, bounded by the Saône and the Jura range, the Dombes and the Doubs, with Bourg as chief town. It raises cattle and noted poultry.

Brest, a strongly fortified city in the department of Finistère, one of the chief naval stations of France, is situated 313 miles W. of Paris, on the north side of the Bay or Road of Brest. One of the finest harbours in Europe, the roadstead is formed by the promontory of Finistère on the north and of Quêlern on the south. The only entrance to the bay is by a narrow channel called *Le Goulet*, which is scarcely a mile wide, and is strongly defended by batteries; the difficulty and danger of access to hostile ships being increased by rocks in the middle of the channel. The roadstead from this entrance to the mouth of the Elon is about 6 miles in length. Under Napoleon III. and from 1883 onwards vast sums have been expended on harbour and fortification works. The small river Penfeld flows through the town; on its left bank is the town proper, on its right the suburb of *Recouvrance*, connected by a splendid iron swing-bridge (1861), 65 feet high, and 347 long; its mouth is the naval port. Brest is, on the whole, irregularly built on an uneven site, and has steep, narrow, dark streets. In some places communication between the lower and upper parts of the town can be effected only by stairs. A fine avenue, the Cours d'Ajot, runs along the shore to the south of the town towards Portstrein. Here the commercial harbour is situated. There are an old castle, an exchange, town-house, observatory, and public library. Brest has extensive shipbuilding yards, rope-walks, quays, arsenals, and dry-docks; naval schools, barracks, and hospitals. The principal imports are coal, grain, fertilisers, timber; exports are fruit, vegetables, farm produce. Chiefly engaged in the equipment of the navy, Brest has important fisheries (sardines, mackerel, oysters, &c.); also sawmills, breweries, tanneries, soap-works, and manufactures of candles, corks, and varnished hats. The Bagnes or hulks were closed in 1860. Its splendid position made Brest an object of contention to French, English, and Spaniards. The Count of Leon ceded Brest to the first Duke of Brittany in 1040; it was given up to the English by Duke John IV. in 1372, but again came into the hands of the dukes; it was held by an English garrison till 1397. Again held by the English, it was retaken by the French, to whom it passed on

the marriage of Louis XII. to Anne of Brittany. In 1631 Cardinal Richelieu resolved to make it a naval station, and commenced the fortifications completed by Vauban. In 1694 the English under Lord Berkeley were repulsed here with great loss. In 1794 the French fleet under Villaret-Joyeuse was defeated off Brest by the British fleet under Howe on 'the glorious first of June.' Pop. (1872) 66,272; (1911) 90,540; (1921) 73,960.

Brest-Litovsk (Polish *Brześć-Litewski*), a strongly fortified town of Poland, on the Bug, commands the intersection of several important railways, being 132 miles ESE. of Warsaw, and 682 miles WSW. of Moscow. It has an extensive trade in its cloth manufactures, Russian leather, soap, and wood. Once the occasional residence of the kings of Poland, it is now the seat of a Greek and an Armenian Catholic bishop. It fell to Russia in 1795. By the treaty of Brest-Litovsk (3d March 1918; abrogated by the treaty of Versailles) the Russian Bolshevik government gave up the western and Caucasian regions, and agreed to an indemnity and economic advantages to Germany. Pop. 54,000.

Bretagne, BRETON LITERATURE. See BRITANY.

Brethren. See BROTHERHOODS.

Brétigny, a village in the French department of Eure-et-Loir, 50 miles SW. of Paris. Here, in 1360, Edward III. concluded a peace with France, by which John II. of France was released from his captivity in England on agreeing to pay three million crowns for his ransom, whilst England renounced her pretensions to Normandy, Anjou, Maine, and Touraine, and was confirmed in possession of Gascony, Guienne, and several other parts in France, recently acquired by conquest.

Breton, CAPE. See CAPE BRETON.

Breton, JULES ADOLPHE AIMÉ LOUIS (1827-1906), born at Courrières in Pas de Calais, was trained as a painter at Ghent, at Antwerp under Wappers, and at Paris under Drolling. His earlier subjects, such as 'Misère de Désespoir' (1849), are taken from the French revolutionary period; but he soon turned to scenes from peasant life which he treated in a most poetic and suggestive manner, with an admirable union of style with realism. In 1853 he exhibited 'Le Retour des Moissonneurs,' in 1855 his celebrated 'Les Glaneuses,' in 1875 'Les Feux de la Saint-Jean.' He gained distinction also as a poet by his *Les Champs de la Mer* (1875) and *Jeanne* (1880), and wrote on painting and his own life.

Breton, NICHOLAS (1545?-1626?), was the son of William Breton, a London merchant, and stepson of George Gascoigne. For sixty years at least he was an assiduous and fluent writer of lyrical, pastoral, satirical, religious, romantic, and humorous verse and prose. With a freedom from coarseness quite exceptional in his time Breton unites great freshness of observation of nature, melody of versification, ease, and lucidity. In satire he introduces a genial humour unknown to his English contemporaries, and his management of stanza-forms for this purpose anticipates Frère. All his work suffers in effectiveness from those qualities of which his refinement and ease are the better side; but his spirits never flag. His *Works* were edited by Grosart (1877-93).

Bretón de los Herreros, MANUEL (1796-1873), Spanish dramatist, was born at Quel (Logroño), and served as a volunteer in the army from 1814 to 1822. Subsequently he held several government offices, but was always losing them—finally in 1840—on account of his expression of Liberal opinion. He brought out upwards of 150 pieces, partly original, partly adaptations from the older Spanish classics, and partly translations from

the Italian and French. He also wrote innumerable poems, tales, and sketches.

Bretschneider, HEINRICH GOTTFRIED VON, a satirist, of unsettled life and eccentric habits, born at Gera in 1739, from the Moravian Institute at Elbersdorf passed to the Gymnasium at Gera, and at seventeen entered the army. In 1778 he became librarian to the university of Ofen (Buda), and in 1782 Joseph II. gave him a government appointment. He died in 1810. Of his numerous works, including plays and poems, the chief are his satires, *Almanach der Heiligen auf 1788* and *Walters Leben und Sitten* (1793).

Bretschneider, KARL GOTTLIEB, a distinguished German theologian, born 11th February 1776, at Gersdorf, in Saxony, studied theology at Leipzig, was appointed pastor at Schneeberg in 1807, general superintendent at Gotha in 1816, and afterwards councillor of the Upper Consistory there. He died at Gotha, 22d January 1848. Bretschneider established a reputation as a sound and judicious thinker of rationalistic bias, and his theological writings are admitted to have a permanent value. In 1820 appeared his *Probabilia de Evangelii et Epistolarum Johannis Apostoli Indole et Origine*, an attack upon the Johannine authorship from internal evidence, and in 1824 his *Lexicon Manuale Græco-Latinum in Libros Novi Testamenti*. Another work of importance is his *Handbuch der Dogmatik* (4th ed. 1838). Besides these, Bretschneider wrote on various theological questions and controversies. An autobiography was published at Gotha in 1851.

Bretten, a town of Baden, the birthplace of Melancthon, 16 miles ENE. of Karlsruhe by rail. The house in which the Reformer was born belongs now to a foundation bearing his name for the support of poor students, established in 1861. A monument was erected in 1867. Pop. 5000.

Bretts and Scots, THE LAWS OF THE (Lat. *Leges inter Brettos et Scotos*), the name given in the 13th century to a code of laws in use among the Celtic tribes in Scotland. The 'Scots' were the Celtic people dwelling in the western and more mountainous districts north of the Forth and the Clyde, who, when it became necessary to distinguish them from the Teutonic inhabitants of the low country, received the names of 'the Wild Scots,' 'the Irishry of Scotland,' and, more recently, 'the Scottish Highlanders.' The 'Bretts' were the remains of the British or Welsh people, who were at one time the sole or chief inhabitants of the region now divided into the shires of Dumbarton, Renfrew, Ayr, Lanark, Peebles, Selkirk, Roxburgh, Dumfries, and Cumberland. This province was for some centuries an independent kingdom, known by the names of 'Cumbria' and 'Strathclyde.' It became about the middle of the 10th century a tributary principality held of the king of the English, by the heir of the king of the Scots. It so continued till after the beginning of the 12th century, when Cumberland having been incorporated with England, the gradual absorption of the rest of the territory into the dominions of the king of the Scots seems to have been imperceptibly completed. The last 'Prince of Cumbria' named in record was the brother and heir of Alexander I. of Scotland, 'the Earl David,' as he was called, who, on his brother's death in 1124, himself became king of the Scots. No more is heard of Cumbria as a principality; but 'the Welsh' continue to be named among its inhabitants, in the charters of King David's grandsons—Malcolm the Maiden (1153-65), and William the Lion (1165-1214). And they seem to have retained more or less of their ancient Celtic laws until after the beginning of the 14th century. It was not until the year

1305 that an ordinance of Edward I. of England, who appeared then to have reduced all Scotland to his subjection, decreed 'that the usages of the Scots and the Bretts be abolished, and no more used.' It is unknown how far this prohibition took effect. Of the code which it proscribed, only a fragment has been preserved. It was printed by Sir John Skene, in his *Regiam Majestatem* (1609); and by Thomas Thomson and Cosmo Innes, in the *Acts of the Parliaments of Scotland*, vol. i. (1844), where the laws are given in three languages—Latin, French, and English. The French version, which is the oldest, is printed from a manuscript of about 1270, formerly in the public library at Bern, in Switzerland, now in the Register House at Edinburgh. The fragment of the 'laws of the Bretts and the Scots' thus published, is of much the same nature as the ancient laws of the Anglo-Saxons, the Welsh, the Irish, and other nations of Western Europe. It fixes the *cro*, or price at which every man was valued, according to his degree, from the king down to the churl, and which, if he were slain, was to be paid to his kindred by the homicide or his kindred. The *cro* of the king was 1000 cows; of the king's son, or of an earl, 150 cows; of an earl's son, or of a thane, 100 cows; of a thane's son, 66½ cows; of the nephew of a thane, or of an oghthiern, 44 cows and 21½ pence; and of a villain or churl, 16 cows—all persons of lower birth than a thane's nephew or an oghthiern being accounted villains or churls. The *cro* of the married woman was less by a third than the *cro* of her husband. The *cro* of the unmarried woman was as much as the *cro* of her brother. A chapter 'of blood-drawing'—corresponding with the *blod-wite* of the English—fixes the fine to be paid for a blow to the effusion of blood, according to the degree of the person wounded and the place of the wound.

Bretwalda, a title of supremacy among the early Anglo-Saxon kings, the exact signification and history of which are highly uncertain. The *Anglo-Saxon Chronicle* says of Egbert, 'and he was the eighth king that was *Bretwalda*,' and the word only occurs elsewhere in an English and Latin charter of Athelstan in 934, in which that king is styled 'King of the Anglo-Saxons and *Brytaen-walda* of all the island.' Palgrave attempted to explain the title as 'wielder of Britain,' an honour to which the most powerful king was elected, and which was substantially an assertion of a kind of continuity with the old Roman imperial power within the island. Kemble explained the word as merely 'wide ruler' (*bryten*, 'broad'), and ridiculed the idea of any kind of federation and elective hegemony among the early English kings. Freeman inclined to 'an intermediate position between Kemble and Palgrave,' but refused to admit the idea of Roman influence, maintaining that the institution was of purely English growth. The *New English Dictionary* favours Palgrave's view.

Breughel, PIETER, the founder of a family of Dutch painters, was born in the village of Breughel, near Breda, in 1525 (or, as others say, 1520), and died at Brussels in 1569. After travelling through Italy and France, he fixed his residence at Antwerp, where he was elected to the Academy. He painted chiefly the pleasures of rustic life, which he transferred to his canvas with vivid colouring, and at times unnecessary coarseness.—His son, PIETER, distinguished by the strange title 'Hellish Breughel'—because he loved to paint scenes in which the leading characters were devils, hags, or robbers—was born about 1564, and died 1637.—JAN, brother of the preceding, usually called 'Velvet Breughel,' from his rich dress, was born in 1568, and died in 1625. He was chiefly a flower-painter, but was

also distinguished for his landscapes and for his minute finish of small figures. He painted several works in concert with Rubens, who supplied the chief figures.—Other members of the same family attained to some note, in most cases as painters of still-life. See monograph by Michel (Paris, 1892).

Breve, a note in Music. The name was originally applied to the shortest of the three notes used in early music, but is now appropriated to the longest note met with, and it occurs but seldom, except in church music, modern music being divided into bars which usually fall short of it in length. It has the time-value of two semibreves, and was formerly written thus, $\equiv$, now $\text{||}\text{O}\text{||}$ or $\text{||}\text{O}\text{||}$. The expression *alla breve* at the beginning of a piece—also denoted by the vertical stroke through the sign of common time, C —signifies that the time-value of the notes is reduced to one-half.

Breve, or BRIEVE, in the practice of the Scots law, is a writ issuing from Chancery in the name of the crown, to a judge, ordering him to try by jury the points or questions stated in the breve. In ancient times these writs appear to have been the foundation of almost all civil actions in Scotland; but latterly they have been used only in the following cases: (1) Breve of Inquest, now, however, superseded by a petition of service to the sheriff to ascertain the heir of a deceased person. (2) Breve of Tutorry, the purpose of which is the appointment, as guardian to a pupil, of the nearest agnate or person most nearly related through the father, of lawful age. (3) Breves of Idiocy and Furology, for the appointment, in case of ascertained insanity, of the nearest male agnate, of lawful age, as guardian or curator. Proceedings 2 and 3, however, are much superseded by the appointment of judicial officers. (4) Breve of Terce is to enable a widow to recover her terce or dower. It is issued to the sheriff of the county, who divides the possession of the land between the widow and the heir (see TERCE). (5) Breve of Division amongst heirs-portioners. By means of this breve an heir-portioner—i.e. one of two or more sisters succeeding in equal portions to a landed estate—may have her share of the lands separated or set apart by a judge, who appoints an inquest, or jury of fifteen persons. An arbitration or ordinary action is now more generally resorted to. See HEIRS-PORTIONERS.

Brevet (Fr., 'a writ' or 'warrant'), in the British army, is a promotion of officers by selection to a higher rank irrespective of there being any vacancies in its established numbers. A general promotion by brevet used formerly to be made once in about six years; but more recently it was limited to very special occasions, as a coronation, the birth of an heir to the throne, the termination of some great war, &c., and given only to officers who had some particular claim to promotion. A brevet was determined on by the cabinet, and carried out by the commander-in-chief. It had formed part of the British military system ever since the time of James II.; but it was unsatisfactory, because the flow of promotion caused by it was arbitrary, uncertain, and much liable to abuse. There were brevets in 1837, 1838, 1841, 1846, 1851, and 1854, some of all ranks, from lieutenant-general to captain, receiving promotion; but it must not be forgotten that death and sales had in the intervals cleared off perhaps an equal number of officers at the higher rates of pay. On one of these occasions 200 colonels were at once made major-generals. In 1854 the new major-generals alone involved an additional charge of £18,000 a year. In that year general brevets were abolished—a fixed establishment of general officers being substituted; but individual brevets

were still given to field officers after five years' service in each rank, and to all officers, except subalterns, for distinguished service in the field. This promotion carried with it the higher rate of pay, but was neither purchasable nor saleable. It has never been given to officers below the rank of captain; but in a very few special cases, such as that of Lieutenant Chard, V.C., of the Royal Engineers, after his heroic defence of Rorke's Drift in the Zulu war of 1879, a subaltern has been promoted to captain out of his turn, in order that brevet rank might be forthwith conferred. The holder retains his place and rank in his regiment if it is alone, but if acting with other troops he will take command of the whole force, provided that he is senior by brevet, or, as it is called, 'army' rank, to the other officers. This rule has been known to cause a change of command in the middle of an operation, which, on active service, is very undesirable. The official title of an officer holding brevet rank is captain and brevet-major, or the like; but an officer may have as many as three brevets, and be a captain and brevet-colonel. All colonels are placed on a seniority list for promotion to major-general, so that it is possible by means of brevets greatly to accelerate the promotion of a deserving officer to that rank.

There is no brevet promotion in the navy.

In the United States, brevet rank does not entitle the holder to the higher rate of pay, nor to corresponding rank, except under special circumstances defined by law.

Breviary. By this word Roman Catholics understand the book which contains all the ordinary and daily services of their church except (a) those connected with the celebration of the Eucharist, which are contained in the *Missal*, and (b) those for special occasions, such as baptisms, marriages, ordinations, funerals, &c., which are contained in the *Ritual* or *Pontifical*, according as they fall within the sphere of ordinary priests or of bishops. In the Established Church of England, therefore, the breviary would be exactly represented by a Prayer-book containing, after the preface, tables, &c., the morning and evening prayer, litany, Athanasian creed, collects, psalter, and all the lessons for every day in the year, with the addition of a complete set of hymns for the different occasions. What is called a 'Church Service,' with *Hymns Ancient and Modern* bound in, is, in fact, a breviary, only differing from the contents of the Latin one in the fact that it provides only for Sundays and holidays, that the hymns are more or less left to selection, and that it contains the Eucharistic and occasional offices in addition. The word breviary is colloquially applied by Latin-Catholics to the corresponding portion of the services of the Oriental churches—e.g. one may hear the remark that the services of the Greek breviary are very long, or those of the Coptic breviary very unchanging—but the present article deals only with Latin breviaries.

The word itself signifies an *abbreviation* or *summary*, and is used to indicate that the book is a *compilation* designed to obviate the necessity of using several different books in the same service, that is to say, a separate book for the prayers, a hymn-book, a Bible from which to read the lessons and Psalms, copies of the Fathers from which to read their homilies, &c. An Anglican *Church Service* is a compilation on exactly the same principle and for the same object, as well as very similar in contents. The origin of the different hours of prayer during the day, which is undoubtedly older than Christianity, and adopted by the church from the synagogue, is beyond the scope of this article, as are also the changes and modifications which they have undergone. The

compilation called the breviary is believed to owe its origin to Gregory VII. in the 11th century. It underwent several changes under succeeding popes, and in 1536 Francis, Cardinal de Quiñones, a Spaniard, published at Rome a reformed breviary which had the approval of Clement VII. and Paul III. It was, at least in the earlier editions, perhaps too sweeping in its changes, but is of great merit, insuring the reading of the whole Book of Psalms every week, and of almost all the New Testament and a great part of the Old every year. It is upon this work that the daily service of the English Established Church is largely modelled, some parts of the preface being embodied entire in that of the Book of Common Prayer. The use of this breviary was never made compulsory, but while it was permitted as a substitute for the unreformed breviary, it was very widely adopted both for public and private worship. It was, however, considered that its services were both too short and too divergent from ancient custom, and Pius V., in conformity with a decree of the Council of Trent, issued in 1568 a reformed edition of the old Roman breviary, which he imposed absolutely upon all the Latin churches, to the exclusion of the breviary of Quiñones, and of all other breviaries which did not possess an antiquity of 200 years. This breviary was further altered by Clement VIII. and Urban VIII., the latter of whom, with deplorable taste, made a series of changes in the texts of the hymns which has been most disastrous to both the literary merit and the historical interest of these poems. The breviary has since undergone many other modifications, chiefly by the addition to the calendar of great numbers of feast-days in honour of saints, to such an extent that the ordinary service of a week-day became very uncommon. Thus in 1883 Pope Leo XIII. permitted, though not commanded, the substitution for the week-day service, upon almost every day in the year, of a voluntary office of a festal character according to the day of the week. The state to which the practical use of the breviary has thus been reduced, especially by the virtual abrogation of the weekly reading of the whole Book of Psalms, which is, in theory, its main intention, is now acknowledged on all hands to call for a new and sweeping reform. This reform will probably follow, at least in this respect, the lines of the reformed breviary of Cardinal de Quiñones. It may be regarded as imminent, and had the sittings of the Vatican Council been continued, would very likely have taken place before now.

The exception made by Pius V. would have spared some at least of the old English breviaries, but owing chiefly to the English Roman Catholic clergy being educated abroad in the 16th, 17th, and 18th centuries, their use has become extinct. Great numbers of new breviaries were, however, brought into use in France in different dioceses in the 17th and 18th centuries. These are generally works compiled with great care and learning. They are mainly distinguished for an exclusive use of scriptural phrases, an intense nationalism, the substitution for early and medieval hymns of compositions written in imitation of Horace by French scholars, and certain indications of a leaning to the doctrines of Jansenism. They are now almost, if not entirely, extinct, the Roman breviary having been adopted in their stead. The principal Latin breviaries at present in use, other than the Roman, are the Monastic, used by all the male and female disciples of St Benedict—i.e. by all monks and nuns properly so called; the Dominican, used by all disciples of St Dominic; the Ambrosian, in the ecclesiastical province of Milan; and the Mozarabic, the original national rite of Spain, in use in certain places in Spain and Portugal.

What here follows will relate only to the Roman breviary. It is to be observed at the same time, that wherever the Roman breviary has been introduced, it has been subjected to additions to the calendar and other changes, so as to give it a local or national colour. In England, for instance, there are about seventy days in the year—without reckoning others within octaves, alterations in importance, or changes of date—upon which the service differs from the text of the Roman breviary.

After the general rubrics, tables to find Easter, calendar, &c., the body of the breviary is divided into five parts. The first of these consists of the Book of Psalms arranged in sections, with the daily prayers and some hymns, for the different services of the day and week. The first of these is *Matins*, which properly belongs to midnight, but is usually said in Italy about 7.30 or 8 A.M. In France, on the contrary, it is usual to forestall it on the preceding evening. It consists of Psalm xcv. (*Venite*) and a hymn, followed by one or three sections called *Nocturnæ* or *Watches of the Night*. On Sundays there are three of these, the first containing twelve psalms, and each of the others three. At the end of each is read a lesson, divided into three portions, whence the whole are counted as nine. The first reading is from Scripture, the second from one of the Fathers, and the third from one of the Fathers, on the gospel which will later be read at mass. The *Te Deum* usually follows. On week-days there is only one *Nocturna* of twelve psalms, and one lesson (three), all from Scripture. The second daily service is *Lauds* or the *Morning Praises*, theoretically proper to sunrise. It consists of four psalms, a Scripture canticle, Psalms cxlviii., cxlix., and cl., a hymn, the *Benedictus* or Thanksgiving of Zacharias (Luke, i. 68-79), and prayers. The succeeding services, or *Little Day Hours*, are *Prime* or the *First Hour* (6 A.M.), *Terce* or the *Third Hour* (9 A.M.), *Sext* or the *Sixth Hour* (noon), and *None* or the *Ninth Hour* (3 P.M.). They are all alike, consisting of a hymn and some sections of Psalm cxix. (Vulgate cxviii.), followed by a prayer. *Prime* differs a little from the others, being susceptible of some extra and changing psalms, and on Sundays of the creed of St Athanasius, and containing special prayers for the morning; in choirs, a lesson is also read at it taken from the Martyrology. *Vespers* or *Evening* is theoretically proper to sunset, and is reckoned to begin the next day, according to the eastern reckoning—'The evening and the morning were the — day.' It consists of five psalms, which vary according to the day of the week, a hymn, the *Magnificat* or Thanksgiving of the Blessed Virgin (Luke, i. 46-55), and prayers. *Completorium* or *Compline*, 'the completing service,' belongs theoretically to 9 P.M., and is a supplication for protection during the night. It is always the same, consisting of the general confession, four unvarying psalms, a hymn, the *Nunc Dimittis* or Song of Simeon (Luke, ii. 29-32), prayers, and a Commemoration of the Blessed Virgin. The unchanging character of this and of the *Little Hours* conveys no idea of the practical monotony from day to day. This arises from the multiplication of festivals of saints already spoken of. These have, practically speaking, always got special psalms, which are always the same at lauds, and vary very little at vespers and matins. Hence, as a matter of fact, about fifty or sixty psalms are repeated constantly, and the others rarely or never.

The second part of the breviary consists of what is called the *Proprium de Tempore*. This means the whole service for Sundays and week-days as dependent upon Christmas and Easter. It contains the homilies of the Fathers, hymns, &c. for the whole year, as far as so dependent, but is

mainly occupied by the course of daily scripture-reading. This consists of selected extracts averaging about 20 verses a day. Roughly speaking, Isaiah is read in Advent (the three or four weeks preceding Christmas), the epistles of St Paul from the Epiphany (January 6) till Septuagesima (the ninth Sunday before Easter), when Genesis is begun, but broken off at chapter xiv. on Shrove Tuesday. Homilies, not Scripture, are read in Lent, except on feasts of saints, and then the Scripture is special, but Genesis continues to be read on Sundays, and a small portion of Jeremiah and Lamentations in the last fortnight. A week after Easter the Catholic Epistles and Apocalypse are begun and read till Whitsunday. A week after Whitsunday, Samuel and Kings are begun, and read till the beginning of August. At that date Proverbs are begun, and followed by Ecclesiastes, Wisdom, Ecclesiasticus, Job, Tobit, Judith, Esther, both books of Maccabees, and the rest of the Prophets. The weakness of this arrangement, besides the scantiness and scrappiness of the extracts, is in the omission of so much, including entire books and the greater part of the Pentateuch. It forms, however, a kind of imperfect epitome of scriptural history, and a limited course of scriptural reading.

The third part of the breviary consists of what is called the *Proprium Sanctorum*, or special offices of saints. This consists of whatever is special to any day fixed by the day of the month. The greater part of it as regards bulk is occupied by summaries of saints' lives, exactly like articles in a biographical dictionary. This is certainly the weakest part of the breviary, and is accordingly always selected as the point for controversial attack. Although sometimes drawn up with care and frequently altered—as was done by Leo XIII. among others—to keep them abreast of historical criticism, the biographical notices are open to the charge of occasional inaccuracies in matters of fact. A notion sometimes obtains among Protestants that Roman Catholics are obliged to believe these biographies. This is wholly baseless. No such idea exists even as a superstition. As these notices embrace the lives of a very great number of persons of religious eminence, of all nations, ages, and conditions, they form a sort of imperfect epitome of church history, just as the Scripture readings form one of Scripture.

The fourth part of the breviary is called the *Commune Sanctorum*. This is a series of twelve offices for festivals of saints according to the class to which he or she may belong. They are for (1) the eves of apostles; (2) the feasts of any martyrs, including apostles, within the season from Easter to Pentecost; (3) apostles and evangelists; (4) a single male martyr; (5) a group of several martyrs; (6) a canonised bishop not a martyr, technically styled *confessor*, as having confessed Christ before men, though not by death; (7) a confessor not a bishop—i.e. a priest or layman; (8) doctors of the church—i.e. certain eminent theologians, but this differs little from 6 or 7; (9) virgins, divided into martyred and not martyred—the latter are mainly canonised nuns; (10) other women; (11) dedication festivals of churches; (12) the Blessed Virgin Mary. The *Commune Sanctorum* is the most used of any part of the breviary. In fact, the service from day to day usually consists of 4, 6, 7, and 9, with occasional changes to 2, 3, 5, and 12. All these have special psalms, which differ little, 6, 7, and 8 being absolutely the same, as also 9, 10, and 12, and 2 having the psalms of 3, 4, or 5. The festal office is a good deal shorter than others, a circumstance which probably accounts for a good deal of its multiplication. There are three *Nocturnæ* at matins, with only three psalms in each. At the

end of the first are read the lessons from Scripture, which are usually those of the day from the *Proprium de Tempore*, as only festivals of some importance have special Scripture lessons; at the end of the second is read the biographical notice; at the end of the third, a homily on the gospel. These lessons of the third Nocturn, which are often most striking and powerful passages from the greatest writers of the early church, vary a good deal, and form, along with those of the *Proprium de Tempore*, a sort of imperfect epitome of theology, as those of the first Nocturn do of Scripture, and those of the second, of church history.

The fifth part of the breviary consists of extra services, the principal of which are the vespers (*placebo*), and matins, and lauds (*dirige*) of the dead, and the Little Office of the Blessed Virgin Mary. None of these extra services are ever obligatory, except that of the dead on All-Souls' Day. It is funeral in character, and is mainly used at funerals, anniversaries of deaths, &c. The Little Office of the Blessed Virgin is a sort of abbreviated festal office of the Blessed Virgin, with only one Nocturn. It contains 31 psalms daily, with 4 canticles, hymns, prayers, &c., and is very widely used by itself among the laity and the active religious orders.

Notwithstanding the weaknesses of its scriptural course of reading and its biographical notices, and the practical monotony caused by the multiplication of festal offices, the breviary forms a marvellous mine of powerful and tender religious thought, amassed by the devotional experience of ages. It must be remembered that at every separate service, nearly all, or by far the largest part of the matter used, is the language of Scripture, a circumstance which invests the office with great grandeur and vitality. The readings form a sort of storehouse, albeit imperfect, of scriptural, historical, and theological knowledge. Exquisitely chosen quotations or adaptations of Scripture also enter largely into what are among the most striking passages of the breviary—viz. the *Invitatories* or exhortations to worship joined to the *Venite*, the *Antiphons* or anthems attached to the psalms and canticles, the *Short Responsories* which precede the prayers at the little hours and compline, and above all, the responsories by which each section of the lesson at the end of each nocturn is followed. These are always poetical, generally beautiful, and not unfrequently rise to the sublime.

The rules for arranging the service for every day, and especially for uniting and harmonising the *Proprium de Tempore* with the *Proprium Sanctorum*, are contained in the general rubrics, and fill 37 chapters. Being printed in black, with the quotations and technical words in red, these pages present a motley appearance, which has obtained for them the technical name of the *Pica* or *Pie* (cf. *magpie*, *piebald*). The rules are so complicated that it would be almost impossible for any one to find the service for himself upon the spur of the moment, upon any given day. This difficulty is accordingly met by the publication in every separate country or diocese of a sort of annual almanac, called the *Ordo Recitandi Divini Officii*, which contains under every day, clothed in a mass of technical contractions, minute directions as to what is to be read.

The breviary is sometimes to be met with in one bulky volume, in which case it is called a *Totum*; sometimes, especially in Spain, in two; but most frequently in four, for spring, summer, autumn, and winter, in which case each volume contains the Psalms, a quarter of the *Proprium de Tempore*, about a third of the *Proprium Sanctorum*, and the whole of the *Commune Sanctorum* and the additional matter.

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The duty of publicly joining in or privately reading aloud—i.e. so as to utter every word with the lips—the whole of the breviary services every day, is incumbent upon all clerks in holy orders, all members of religious orders, male or female, and every person holding a benefice (such as a prebend) to which attendance in choir is normally attached. The serving brethren or sisters in religious orders, and the members of active religious orders, such as sisters of charity, form an exception, but these are always bound to some shorter substitute, such as the Little Office of the Blessed Virgin, a similar office in praise of the Blessed Sacrament, or the like. In all properly conducted cathedral and collegiate churches, the service is performed publicly every day with surpliced choir, &c., as in similar institutions in the English Established Church; the ceremonial is also similar, except that, if the service is choral, incense is offered during the *Benedictus* and *Magnificat*. For this purpose the services are usually massed together, as matins and lauds at 7.30 or 8 A.M., prime, terce (after which high mass is sung), sext, and none, at 9.30 or 10, and vespers and compline at 4. The time consumed varies, principally according to the amount of music used. A person reading alone and pronouncing rapidly can read the whole of the services of the day through in about two hours, or even less. In the cathedral of Seville, on the other hand, where the entire daily service is sung with the utmost pomp and solemnity, and with the addition of generally two, often three, and sometimes four high masses, as many as eight hours are often spent in choir.

The use of the breviary as a book of private devotion by laymen has become rare since the invention of printing has led to the multiplication of devotional works of different kinds, but at present seems to show some tendency again to increase, and it has always been a common custom to sing vespers or compline, at least on Sundays, in parochial and other public churches. For this reason, most Roman Catholic manuals of devotion contain compline and the more common psalms of vespers. Spanish prayer-books usually contain the ordinary forms of all the services except matins; and in that country the singing of such services in the parochial churches, and the participation of the laity in them, is more common than elsewhere.

The Parisian breviary of 1737 was translated into French as the *Bréviaire Français*. There are French and German translations of the Roman breviary; and the Marquis of Bute, author of the preceding article, published an English version in 1879. See Mgr. Pierre Batiffol, *Histoire du Bréviaire Romain* (1893; trans. 1911); German works by Pleitner (1887) and Bäumer (1895); and the Cambridge edition of Quignon's breviary, 1888.

Breviary of Alaric. See CODE.

Brevipennes (Lat., 'short-winged'), an obsolete name, applied by Cuvier to the running-birds like ostrich, rhea, and emu, in which the wings are rudimentary. See BIRD, OSTRICH, &c.

Brewer, JOHN SHERREN, born at Norwich in 1810, graduated with classical honours at Queen's College, Oxford, in 1833, took orders, and was appointed professor of English in King's College, London, in 1841. For nearly twenty years he laboured in the Record-office, editing the *Monumenta Franciscana* (1858); the *Opus Tertium* and *Opus Minus* of Roger Bacon (1859); vols. i.-iii. of *The Works of Giraldus Cambrensis* (1861); the *Calendar of the Carew Papers* (1861), with the aid of Mr Bullen; and vols. i.-iv. of the *Calendar of Letters and Papers, Foreign and Domestic, of the Reign of Henry VIII.* (1862-72). As an editor, Brewer possessed patient industry and a rare sense

of order, besides marvellously sound judgment and extensive knowledge. His essays and reviews in *English Studies*, edited by Dr Wace, with a brief biography (1880), reveal his vast knowledge and his broad sympathies, as well as a delicacy of touch and a fineness of literary insight seldom found in the laborious student. Brewster was elected Honorary Fellow of Queen's College in 1870, and in 1877 was presented to the living of Toppesfield, in Essex, where he died February 16, 1879.

Brewing. See BEER.

Brewster, SIR DAVID, an eminent Scottish natural philosopher, was born at Jedburgh, December 11, 1781. From the early age of twelve he was educated for the Church of Scotland at the university of Edinburgh, where he highly distinguished himself. A constitutional nervousness disinclining him for a clerical life, he became editor in 1802 of the *Edinburgh Magazine*, and in 1808 of the *Edinburgh Encyclopædia*, to which he contributed many important scientific articles. Previous to this he had entered deeply on the study of optics, with which his name is now enduringly associated. The beautiful scientific toy called the kaleidoscope was invented by him in 1816, and many years after he improved Wheatstone's cumbrous stereoscope by the introduction of lenses, and produced the lenticular instrument now in use. In 1819 the *Edinburgh Philosophical Journal* took the place of the *Magazine*; and in 1831 Brewster was one of the chief originators of the British Association. In 1815 he was elected a Fellow and Copley medallist of the Royal Society; in 1816 he received half the prize bestowed by the French Institute; in 1818 the Royal Society awarded him the Rumford gold and silver medals for his discoveries on the polarisation of light; in 1825 he became corresponding member of the Institute of France; in 1832 he was knighted, and had a pension conferred upon him; in 1838 he was appointed principal of the united colleges of St Salvator and St Leonard, St Andrews; in 1849 he was elected one of the eight Foreign Associates of the French Institute; he was also a member of the academies of St Petersburg, Berlin, Copenhagen, and Stockholm. In 1859 he was chosen principal of Edinburgh University, and filled this post until within a few months of his death at Allerly, Melrose, February 10, 1868. He made important discoveries in every branch of the great subject of polarisation, and in most departments of optics, dealt with optical illusions, the colour of mother-of-pearl, fringes of colour, the optical properties of innumerable substances, biaxial crystals, dichroism, the absorption of light, phosphorescence, fluorescence, photography, and the value of combinations of lenses. The most immediate practical result of Brewster's discoveries was the introduction to British lighthouses of the dioptric system, the honour of having elaborated which he shared with Fresnel. He resolutely maintained his own theory of the three primary colours, and never fully accepted the undulatory theory of light. It has been said that he wrote with the calm decision of a philosopher, the vivid imagination of a poet, and the fervour of a preacher. In 1822 he edited Legendre's *Geometry*, translated by Thomas Carlyle. His *Life of Newton*, first published in 1828 in the Family Library, was issued in a totally new and greatly enlarged form in 1855. Among his other works are his interesting *Letters on Natural Magic*, addressed to Sir Walter Scott; *More Worlds than One* (1854); his treatises on the Kaleidoscope and on Optics (*Cabinet Cyclopædia*); his *Martyrs of Science*; and his treatises in the 7th and 8th editions of the *Encyclopædia Britannica* on Electricity, Magnetism, Optics, the

Stereoscope, &c. He also contributed largely to the *Edinburgh* and *North British Reviews*, and communicated hundreds of papers on scientific subjects to the transactions of learned bodies and to scientific journals. See *Home Life of Brewster*, by his daughter, Mrs Gordon (1869).

Brezowa, a market-town of Czechoslovakia, 40 miles NE. of Presburg; pop. 6000.

Brian, a famous king of Ireland, the Brian Boromhe or Boru ('Brian of the tribute') of the old Irish historians. He succeeded his elder brother as chief of the Dal Cais, on the murder of the latter in 976, and after much fighting, made himself king of Cashel two years later. After establishing his rule over all Munster, he marched into Leinster, and was acknowledged as king by its chiefs in 984. King Brian supported a rude but princely state at his chief castle at Cenn Coradh, near the modern town of Killaloe, and he had also seats at Tara and Cashel. He formed an alliance with Maelsechlainn Mac Domhnaill, chief king of Ireland, crushed with his help an outbreak of the Leinster men in 1000, next made terms with the Danes of Dublin, and with their help overpowered his late ally, compelled him to give him hostages, and thus made himself in theory chief king of Ireland. He next carried his conquering sword to the west, subdued the Connaughtmen, and in their turn the men of the north. After marching from Meath to Armagh, he made a circuit of Ireland, taking hostages from all the territories through which he passed. Thus he had become actual Ardrioh, or chief king of Ireland, and such he remained until his death. In 1013 war broke out again with the Danes of Dublin, who found some Irish allies. The great struggle took place at Clontarf, on the north side of Dublin Bay. The Danes were routed with great slaughter, never again to recover their strength in Ireland; but the aged hero perished in the battle, April 23, 1014. In his lifetime he had defeated the Danes in no less than twenty-five battles.

Brianchon, CHARLES JULIEN, French mathematician, was born at Sèvres in 1783. Besides some important papers contributed to French mathematical journals, he has left small treatises on lines of the second order (1817), and the application of the theory of transversals (1818). He is best known by a theorem, the correlative of Pascal's, which he published in 1806. The theorem is, If a hexagon is circumscribed to a conic, the straight lines joining the three pairs of opposite vertices are concurrent. He died in 1864.

Briançon (ancient *Brigantium*), a town in the French department of Hautes-Alpes, 162 miles NNE. of Marseilles by rail, on the right bank of the Durance, which is here spanned by a bridge of a single arch 130 feet wide. It is the highest town in France, being situated at an elevation of 4330 feet above sea-level. Pop. 5000.

Briand, ARISTIDE, a French lawyer, born at Nantes in 1862, conducted the bill for separation of church and state, and has been several times premier since 1909. Once an advocate of the general strike, he himself broke a strike in 1910 by calling the strikers to the colours.

Briansk, a trading-town of Russia, on the Desna, 72 miles W. of Orel, with iron and glass works, &c; pop. 30,000.

Briar. See ROSE; also BRIAR-ROOT.

Briare, a town in the French department of Loiret, on the Loire, 87 miles SSE. of Paris. The Canal de Briare (35 miles long), which unites the Loire and the Seine, was the first constructed in France (1642). Pop. 4500.

Briareus (also called *Ægeon*), the son of Uranus and Gæa, who, like his two brothers, had

a hundred hands and fifty heads. He fought for the gods against the Titans (q.v.).

Briar-root, a fine hard wood obtained from the roots of a species of very large heath (*Erica arborea*) which grows in the Pyrenees, in Corsica, and in Algeria. It is largely used for tobacco-pipes. The name is a corruption of the French *bruyère* ('heath'), and has nothing to do with *briar*.

Bribery, as a system affecting all social relations, forms in many countries, and especially among Oriental peoples, a serious difficulty for government, as well as in the conduct of business. In Great Britain the rules of the common law striking at bribery have been reinforced by a long series of statutes, and within recent times it cannot be said that there is any general corruption in either private or public life.

BRIBERY AT ELECTIONS.—During the 18th century parliamentary corruption was a serious abuse. Developed in the reign of Charles II., when king and ministers and opposition alike received bribes from Louis XIV., it was reduced to a system by Sir Robert Walpole, in whose day the votes of electors were regularly bought, and often those of members of parliament. Indirect considerations also, though not always expressed in money, seriously prejudiced appointments to the public service and the administration of justice. In all these matters, however, there is now something approaching to purity. Statutes were passed in 1729, 1809, 1842, and 1854. The committees of parliament never did justice to the petitions against returns obtained by bribery and other corrupt practices; and accordingly in 1868 the jurisdiction in such cases was given to the judges of the Superior Courts with the best results. The Ballot Act tended further to starve out the coarser forms of bribery, because of the uncertainty whether the money produced any result. Under the Corrupt Practices Act, 1883, and other statutes now in force for safe-guarding the purity of parliamentary and other elections, an important distinction is drawn between 'corrupt' practices, which imply guilty knowledge or intention, and 'illegal' practices, which may be done through mere ignorance or inadvertence. The offences included in the category of corrupt practices are: bribery, which, as defined in the Corrupt Practices Act, 1854, consists in offering or accepting a reward to influence a vote, whether the offer is made by the candidate or by any one else; treating, where the reward for voting, or for abstaining from voting, takes the form of food, drink, or other entertainment; undue influence, consisting in the use of force or threats of injury—e.g. a threat to withdraw custom from a tradesman with a view to influencing his vote; and personation, which is defined to mean applying for a ballot-paper in the name of another, or applying for a second ballot-paper when the voter has already voted. Personation, which also includes procuring any person to commit personation, is a felony, and renders the offender liable to imprisonment for two years. The other corrupt practices are misdemeanours, involving fines or imprisonment for one year. Further, a person convicted of any of these corrupt practices is excluded from all electoral rights, and all capacity for public office, for a period of seven years. The offences coming under the head of illegal practices are very numerous, including, e.g., the expenditure of money for conveying electors to the poll or for an excessive number of committee-rooms; the publication of false statements as to the withdrawal of a candidate; and, under an act of 1895, the making of false statements as to the personal character or conduct of a candidate. Any person committing such illegal practices during an election is liable,

on summary conviction, to a fine not exceeding £100. If the elected candidate, or his agent, is proved to have been guilty of corrupt or illegal practices, the election is void. Moreover, if it appears that such practices have extensively prevailed in a parliamentary constituency, the constituency may be deprived of its right to elect members to parliament. Under the Public Meetings Act, 1908, the interruption of political meetings during an election may amount to an illegal practice.

In England, by the Municipal Elections (Corrupt Practices) Acts, 1884 and 1911, and by the Local Government Acts, 1888 and 1894, the law as to bribery at municipal elections, as well as in county and parish council elections, is now substantially identical with the law as to bribery at parliamentary elections. Similarly, in Scotland, by the Elections (Corrupt Practices) Act, 1890, the law as to bribery in parliamentary elections was, with a few modifications, rendered applicable to municipal, county or parish council, and school board elections. In the United States acts have been passed in many states, on the same general lines as the English statutes, with a view to discourage corrupt practices at elections.

BRIBERY OF PUBLIC OFFICERS.—It is an offence at common law, both in England and Scotland, to give or offer a bribe to a public official with a view to unduly influence him in the performance of his duties, or for a public official to take such a bribe. The common law on this subject has been reinforced by the Public Bodies (Corrupt Practices) Act, 1889, passed 'for the more effectual prevention and punishment of bribery and corruption of and by members, officers, or servants of corporations, boards, commissions, or other public bodies.' Under this statute it is an offence, punishable by fine or imprisonment, (1) to corruptly solicit, receive, or agree to receive for oneself or for another, any gift, loan, reward, or advantage, as an inducement to, or reward for, any member or servant of a public body doing, or forbearing to do, anything in respect of any matter or transaction, actual or proposed, in which the public body is concerned; or (2) to corruptly give, promise, or offer any gift, loan, reward, or advantage to any person, whether for the benefit of that person or another, as an inducement to a member or servant of a public body to do, or forbear to do, anything in respect of any matter or transaction in which the public body is concerned. A person convicted under this statute is rendered incapable of holding any public office for seven years from the date of the conviction, and forfeits any public office held at the date of the conviction. Special provision has been made by various statutes against bribery in certain departments of the public service, in which the officials, in the performance of their duties, are peculiarly exposed to this form of temptation. Thus the Customs Consolidation Act, 1876, imposes special penalties for bribery in the case of custom-house officers; the Excise Management Act, 1827, in the case of excise officers; and the Inland Revenue Regulation Act, 1890, in the case of officers of inland revenue.

BRIBERY OF JUDGES.—In England the bribery of judges or judicial officers is a grave offence at common law. A judge who accepts a bribe is, in addition to other penalties, removed from office; and any one who gives or offers a bribe to a judge or judicial officer is punishable by fine or imprisonment. In Scotland the bribery of judges of the Court of Session and of inferior courts is anxiously provided against in a long series of old acts.

BRIBERY OF AGENTS.—The law on the subject of bribery received an important extension by the Prevention of Corruption Act, 1906, which has

brought the paying and receiving of secret commissions within the scope of the criminal law. The taking by an agent of a secret commission had, indeed, long been recognised as illegal. Thus it was well settled that the acceptance by an agent of any such commission justifies his dismissal without notice, and that the principal is entitled to recover the commission from the agent by action. But prior to the Act of 1906 the bribery of an agent did not, as a general rule, render either the agent taking, or the person giving, a bribe liable to the penalties of criminal law. By this act, which applies to Scotland as well as to England, it is made a criminal offence, punishable by fine, or imprisonment, or both, (1) for an agent corruptly to accept or obtain, or to agree to accept or obtain, from any person, for himself or another, any gift or consideration as an inducement or reward for doing, or forbearing to do, any act in relation to his principal's affairs or business, or for showing, or forbearing to show, favour or disfavour to any person in relation thereto; (2) for any person corruptly to give, or agree to give, or offer any gift or consideration to an agent for such an object; and (3) for any person knowingly to give to any agent, or for any agent knowingly to use with intent to deceive his principal, any receipt, account, or other document in respect of which the principal is interested, and which contains any false, erroneous, or defective statement intended to mislead the principal. The term 'agent' in the act includes a person serving under the crown, or under any corporation, or any municipal borough, county, or district council, or any board of guardians.

Brice, St, Bishop of Tours in the beginning of the 5th century, is commemorated as a confessor. *St Brice's Day* (November 13), in 1002 (in Ethelred's reign), is notorious in English history for a great massacre of the Danes. It was believed that it was a concerted attempt to exterminate all the Danes in England; but failing of its bloody purpose, it led to reprisals by the Danish king Sweyn.

Brick. The earliest examples of this branch of the ceramic art were doubtless the sun-dried

bricks of Egypt, Assyria, and Babylonia. Remarkable to say, many of these, which in a northern climate the frosts of a single winter would destroy, have been preserved for some 4000 years by the dry, warm atmosphere of those countries. Sun-baked bricks of ancient date are also found in the mud walls of old towns in India. They are still much used for walls of houses in Persia, but are there faced either with burnt bricks or with plaster of Paris. Kiln-baked bricks must have been the products of a later time; but they are found in all the chief ruins of ancient Babylonia, where they were often used to face or bind together walls of sun-dried bricks, and occasionally they were even ornamented with enamelled colours. Burnt bricks were employed in the foundations of the Tower of Babel (q.v.). These ancient bricks, whether baked by the sun or by fire, were all made of clay mixed with grass or straw. Most of the great ruins in Rome are built of brick, and the Romans appear to have introduced the art into England. Interesting historical information has been obtained from the impressions on Roman, and especially on Babylonian, bricks. Bricks of the modern or Flemish make were used in England in the 13th century. For the unburnt bricks of Texas, Mexico, and Central America, see ADOBE.

Manufacture of Bricks.—Clay suitable for the manufacture of common bricks is an abundant substance, but there is a great difference in the nature and quality of the clays found in various localities. The basis of clay consists of hydrated silicate of alumina, with a varying proportion of other mineral matters, chiefly free silica (sand), iron, lime, magnesia, and potash. Great advantage is derived from digging clay in autumn, and exposing it all winter to the disintegrating action of frost. The next process is that of tempering or mixing the clay into a homogeneous paste, which is done by passing it through mills, principally the pan-mill or the pug-mill (see fig. 2, MM). In making bricks by the old hand process, the shape is given by a mould either entirely of wood, or of wood faced with metal, and without top or bottom. A 'plane' is used to press in the clay, and to smooth the upper and lower surface of the brick.

Although hand-made bricks are still very common, yet machinery is now largely employed to produce them. Brick-making machines are of two leading kinds, one class of them being constructed to work the clay in a wet plastic state, the other class requiring it to be in a dry or half-dry con-

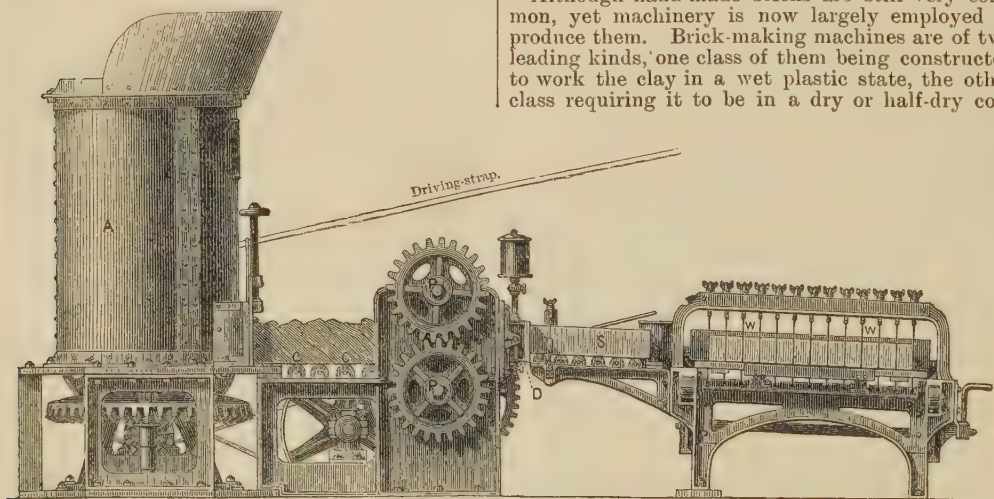


Fig. 1.—Brick-making Machine.

dition. Of the two sorts, the wet-clay machines are the simpler, but the dry-clay machines, by forcing the clay into moulds by strong pressure, shorten the process, as no time is required for drying them. The bricks so made, too, are not only of a

more perfect shape, but they can be moulded into any form, and may even be made ornamental at a very slight additional cost.

Fig. 1 will convey a good idea of the general plan on which most of the wet-clay machines work.

The machine is driven by steam, and the clay is fed by a hopper into the pug-mill, A, on the central shaft of which strong pugging blades are placed in a spiral manner. These prepare and force the clay out at the bottom, whence it passes over the carry-

made bricks. The time required for firing in ordinary kilns varies from 40 to 60 hours for common red and white bricks, while for some fire-bricks 150 hours are necessary. Where kilns are not used, bricks are burned in clamps, the clay requiring to be mixed up, in the process of tempering, with a quantity of ground coal sufficient to burn them. A good test of the character of a clay is obtained by the result of firing. The average contraction in the kiln for prepared clays is $7\frac{1}{2}$ per cent. If a brick contracts much more than this, the clay is too fusible.

All brick clays contain iron, and the colour of a burnt brick almost entirely depends on the amount of it which is present; thus clays containing less than 1 or $1\frac{1}{2}$ per cent. of iron change in the kiln to various shades of cream colour and buff, whilst those containing more than 2 per cent. range in colour from yellowish-fawn to dark red.

Blue bricks are made from the same clay as the red by controlling in a peculiar way the supply of air in firing, and by carrying the heat slightly further. It is asserted by some that the red is changed to the black oxide of iron in the process.

London Stock Bricks.—This is the common kind of brick used in and about London. Fine-sifted ashes and coal are mixed with the clay in its manufacture. It is of a yellowish colour, and very serviceable; but it is only the best qualities of it that are fit for the fronts of buildings.

Rubbers.—Norfolk and Suffolk red and white bricks are largely used for facings in the metropolis and elsewhere. Some kinds of these, as well as some 'mahm stocks,' are soft enough to be rubbed true on the faces and beds for fine work, and they can even be carved.

Staffordshire Bricks.—For fineness of texture and uniformity of colour many bricks made in the pottery districts of this county are the best in England.

Glazed Bricks.—These are made of any desired colour on the face, which is imparted to the glaze. They are highly useful, not only for decorative purposes, but for passages, stables, and other places which require frequent cleaning.

Slate-bricks are made from the debris of slate-quarries. It has been ascertained that bricks composed of powdered slate are among the strongest kinds known.

Fire-clay Bricks.—Refractory clays are abundant in the coal-measures, some of fine quality being found about Newcastle and Glasgow, but the most celebrated is that of Stourbridge. The kinds containing least oxide of iron and alkaline substances make the best, because the most infusible, fire-bricks. Gannister bricks are of the most refractory description. They are made of a highly siliceous fire-clay, and used for steel furnaces (see FIRE-CLAY).

Composition Bricks.—In districts where the Carboniferous formation occurs, excellent building bricks are made of a mixture of fire-clay, shale, and common clay.

Dinas Fire-bricks.—These Welsh bricks are almost pure silica, and were long supposed to stand the high and long-continued heat of metallurgical and other furnaces better than any other known brick. They must not be placed near alkaline substances.

Bauxite Bricks, the most refractory of all fire-bricks, named from *Bauxite*, a clay from Baux,

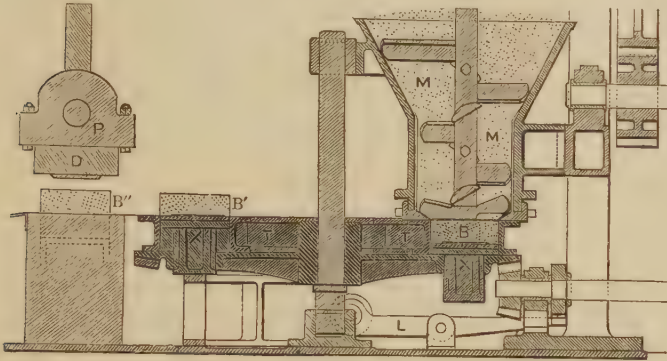


Fig. 2.

ing rollers, C, to the pressing rollers, PP, which force it through a die at D, in a rectangular stream, S, so exactly shaped to the required size that nothing more is necessary than to cut it into single bricks by the wires, W. These are set in a rocking frame, which can be so adjusted as to cut the bricks on the square or at an angle; the one plan being adopted when the clay is at rest, the other while it is in motion. The figure shows what is called a single-ended machine. Some of these machines are provided with a pair of powerful crushing rollers, which reduce any hard lumps or stones before the clay enters the pug-mill. Hollow bricks and drain tiles are made by the same kind of machinery, with peculiarly constructed dies.

Fig. 2 shows a dry-clay machine by Messrs Bradley & Craven, Wakefield, which is considered an excellent one. The figure is a simplified diagram (vertical section) with only the principal parts shown. The machine comprises a mixer (not shown), a pug-mill, MM, a circular rotary moulding table, TT (more darkly shaded than the other parts), and a powerful press, P, worked by an eccentric, and moving in slides. The rotary table may have from twelve to twenty-four moulds round its periphery. In operation the clay is carried forward through the inclined mixer to the pug-mill, from which a pair of moulds (one only seen in figure at B) is directly under the operation of the pug-mill, the blades of which by their screw-like action compress the clay into the moulds. At each partial rotation of the table two pugged bricks are lifted out of the moulds (one seen at B'). These bricks are ejected by the lever, L, acting on the mould-pistons, XX'. Self-acting gear (not shown) delivers the two bricks under the press, one of which is seen at B'. One of the dies of the press, which are kept hot by steam, is shown at D ready to descend upon one of the bricks. After being pressed they are taken to the kiln.

The green bricks, after being carefully dried in a 'clamp' (open-air dryer) or in an artificially heated dryer, are baked in a kiln with a suitable arrangement of fires and flues. Kilns are of many forms, but all come under one or other of two groups—intermittent or single-chamber kilns and continuous kilns. Of the latter the most successful is the Hoffman kiln, consisting of several chambers connected to obtain the best effect of the fuel used (see POTTERY). In it the waste gases from the main firing are utilised to partially burn newly-

near Arles in France. They are composed chiefly of alumina and oxide of iron, with a little silica. The iron is reduced to the metallic state by the addition of a little plumbago.

Floating Bricks.—A diatomaceous earth called fossil meal, and consisting largely of silica, is used to make these curious bricks which float in water. They are made in Tuscany, and are very refractory, but wanting in coherence. A similar earth has been found in the Isle of Skye and one or two other places in Scotland.

American Bricks.—In the United States, bricks are as a rule of excellent quality. The face bricks of Philadelphia and Baltimore are equal to any made in other countries.

Bricklaying. In some countries, and in large provinces or over extensive areas of others, brick is the only available material for house-building. Not infrequently brick has to be resorted to even where stone abounds, if, owing to its hardness, the cost of working it is excessive, or if it be of a perishable nature, or has other faults which render it unfit for building purposes. Most of the towns of southern England, of Holland, and of north Germany are largely or almost entirely built of brick.

The standard size of English bricks being 9 inches by 4½, the thickness of walls is regulated thereby. They are either half-brick, 1 brick, 1½, 2, 3, or 4 bricks in thickness. In moderate-sized modern English houses the inside partition-walls are usually half-brick, the outer walls 1 or 1½. Modern brick houses are, for the most part, far less substantial than those erected by our forefathers. Building leases being usually granted for ninety-nine years, at the expiration of which term the whole property reverts to the freeholder, the object of the builder is merely to make a house that shall stand for that period, and not to expend any money for the sake of further stability. In laying the foundations of walls, the first courses should be thicker than the intended superstructure, and the projections thus formed, usually of quarter brick on each side, are called 'set-offs' (see FOUNDATION).

Mortar composed of lime and sand is the common cement for brickwork. It should be equally and carefully applied; and the bricks wetted, in order that the mortar may adhere more firmly, by being absorbed into their pores (see CEMENTS).

The most important thing in bricklaying is to see that the wall is properly bonded. The bricks of every course should cover the joints of the course below it, or, to use the bricklayer's phrase, the work must 'break bond.' A layer or stratum of bricks is called a *course*. Bricks laid with their lengths in the direction of the course, and their sides to the wall face, are called *stretchers*; those laid transversely, with their ends forming the wall face, *headers*; a layer of headers, a *heading course*; of stretchers, a *stretching course*.

The two kinds of bond almost exclusively used in England are the English and Flemish bond. English bond consists of alternate stretching and heading courses; Flemish bond, of a stretcher and header laid alternately in each course (see figures). English bond is the strongest, Flemish bond the more ornamental; and they are used accordingly. There are two other kinds of bond occasionally used for thick walls. In both, the centre of the wall is filled up with bricks laid diagonally, by what is called in the one case raking courses, and in the other herring-bone work. In order to strengthen the bond, bands of hoop-iron, tarred and sanded, are sometimes laid flatwise between the courses. This 'hoop-iron bond' has superseded the old practice of using bond-timbers. Walls of brick are frequently built hollow, and these dry quicker and perhaps more thoroughly than those

built solid. In such walls there is a thin outer and inner face of brick with hollow spaces between. Different ways are adopted for bonding or tying these walls. Hollow bricks are also used for walls, partitions, floor arches, and other work. Neat pointing of the joints often gives a very pretty appearance to brickwork.

Bricks of the ordinary rectangular shape are often used for arches, leaving the gaping interstices at the upper ends to be filled with mortar, or chips of brick. Such an arch cannot be strong. As the joints radiate to a centre, the arch bricks should be made of or cut to the proper form, just as arch stones are cut to the right shape. In all kinds of bricklaying the walls should be built up level throughout, in order that the *settlement* may be equal, and evidently they should be quite vertical.

Bricklaying is measured by the rod or by thousand. A rod contains 272 square feet of standard thickness—that is, 1½ brick. This is equal to 306 cubic feet, and will, on an average, require 4500 bricks, allowing for waste. A cubic yard contains 384 bricks, and on an average 373 will weigh a ton.

Bricklaying in Frosty Weather.—Building during frost has for some time been carried on in Norway, in Sweden, in Germany, and in Britain also. Originally it was believed that the whole art lay in the use of unslaked lime. But in America bricklaying can be done satisfactorily in the open at a temperature of 16° F. by heating the sand and the water used in making the mortar.

Chromatic brickwork has been very extensively used in England, especially in the revival of the so-called English Gothic, or Venetian Gothic, in which the pointed arch, formed of coloured bricks, forms one of the prominent features (see TERRACOTTA).

Bride (O.E. *brȳd*) alone denotes the newly-married woman; with the addition of the word *groom* (a corruption of O.E. *guma*, 'a man,' allied to Lat. *homo*), the newly-married man (O.E. *brȳd-guma*). *Bride* has cognate forms in the other Teutonic tongues; *bridegroom* has parallels in Dutch *bruide-gom*, Danish *brud-gom*, Ger. *bräutigam*. *Bridal*, the marriage-feast, again, is for *bride-ale* (ale being a common name for a feast, seen in *leet-ales*, *scot-ales*, *church-ales*, *clerk-ales*, *bid-ales*, and *bride-ales*). Originally it meant merely the carousal or drinking in honour of the bride, and indeed *bride-ale* is still in the Cleveland dialect of Yorkshire the name given to the draught presented to the wedding-party on its return from church. See WEDDING.

Bride, St. See BRIDGET.

Bridewell, a well between Fleet Street and the Thames, dedicated to St Bride, which has given its name to a palace, parish, and house of correction. Bridewell was a formidable castle in the days of William the Conqueror, and a residence of early sovereigns. A palace described as 'a stately and beautiful house' was rebuilt here in 1552 by Henry VIII. for the reception and accommodation of the Emperor Charles V. and his



Old English Bond.



Flemish Bond.

retinue; and King Henry himself also often lodged here, as, for instance, in 1525, when a parliament was held in Blackfriars. In 1553 Edward VI. gave it over to the city of London to be used as a work-house for the poor, and a house of correction 'for the strumpet and idle person, for the rioter that consumeth all, and for the vagabond that will abide in no place.' Queen Mary having confirmed the gift, it was formally taken possession of in 1555 by the Lord Mayor and corporation. Thomas Dekker in one of his plays relates the story of Bridewell, though he transports it from London to Milan. The chief portion of the palace was destroyed in the great fire of 1666. The bridewell was afterwards used for other persons than the class above named, and at last became a place of punishment till its removal in 1864. Bridewell House, erected on the hospital estate in 1874, served various purposes. The Royal Bridewell Hospital still educates destitute boys and girls at King Edward's Schools, Witley and Southwark. See PRISON, REFORMATORY.

Bridge, or **BRIDGE WHIST,** a game of cards for four players. It is simpler than Whist or the Russian *Vint*, both of which games it resembles. It made its appearance in London in 1894, and quickly superseded Whist at the clubs. It is now seldom played, its place having been taken by Auction Bridge (see below). In the following description of the game, an elementary knowledge of cards on the part of the reader is assumed. The players sit at a square table, the opposite players being partners. The cards are the ordinary pack of fifty-two. They have values as at Whist, ace being the highest of each suit, then king, queen, &c., down to the two or 'deuce.' The players cut for partners, the two who cut the two cards highest in value (in cutting, the ace is the lowest card) play together against the other two. The player cutting the lowest card has the choice of seat, and deals first. The turn to deal passes from right to

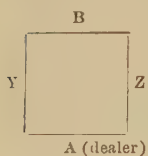


Fig. 1.

left. The figure shows the position of the players at the table. A and B are partners against Y and Z. The cards, after being shuffled, are cut by the player to the right of the dealer. They are dealt, face downwards, one at a time to each player in turn, beginning with the player to the left of the dealer. Thus each player receives thirteen—a 'hand.' When all the cards have been dealt, the dealer, after looking at his 'hand,' must (1) declare the trump suit, or (2) declare 'no trumps,' or (3) leave the declaration to his partner. In making his declaration, the dealer will naturally name his 'strongest' suit—the suit, that is, of which he holds the greatest number or the highest cards. If he hold few high cards in every suit, i.e. if his 'hand' be weak, he will leave the declaration to his partner. If his 'hand' be very strong in three or four suits, he will 'call,' i.e. declare, 'no trumps.' With a very weak—a hopeless—hand, he will declare spades as the suit of least value. The declaration should be made in as few words as possible, and without any qualifying phrase. 'Hearts,' 'No trumps,' 'I leave it to you, partner,' is all that is necessary. Such phrases as 'I will try hearts' or 'I shall have to leave it' are against the etiquette of the game. If the dealer leave the declaration to his partner, the latter must (1) declare the trump suit, or (2) declare 'no trumps.' When the declaration has been made, the player to the left of the dealer, *before playing a card*, has the right of doubling the stakes for that hand. If he do not exercise that right, he says to his partner, 'May I play?' His partner then has the

right to double the stakes. If he do not exercise that right, he says, 'If you please,' and the play begins. (These and other necessary phrases in the game should be used invariably.) If either of the opponents double the stake, the dealer and his partner have, in turn, the right to redouble. The opponents have then the right, in turn, to double again (the opponent who first doubled has, first, the right to double again), and so on, but the doubling must cease before the value of the trick exceeds one hundred points. If the 'call' have been doubled, and the caller and his partner do not wish to redouble, they say, in turn, 'Content,' and the play begins. The player to the left of the dealer leads to the first trick—i.e. he places one of his cards, face upwards, on the table. B, the dealer's partner, then places all his cards, i.e. his 'hand,' face upwards, on the table, and does not take any further part in the play of the hand. A (the dealer) then plays one of B's cards. Z follows with one of his cards, and A completes the 'trick' by playing one of his own cards. A 'trick,' therefore, is the four cards played one from each hand in turn. Every player must 'follow suit' to each trick—i.e. he must play a card of the suit led if he have one. If not, he may (a) trump the trick, i.e. play a card of the trump suit; (b) discard, i.e. play a card of another suit. The trick is won by the side which has played the highest card of the suit led, or the highest trump. Any card of the trump suit will beat any card of another suit. The player whose card wins a trick 'leads,' i.e. plays first to the next trick. When the thirteen tricks have been played, the number won by each side is counted, and points are scored by whichever side has won more than six tricks. Each trick over six counts two points when spades were trumps; four points when clubs were trumps; six points when diamonds were trumps; eight points when hearts were trumps; twelve points when the declaration was 'no trumps.' A game is finished when either side has scored at least thirty points for tricks, but play continues until one side has won two games, i.e. 'the rubber.' Suppose that A (the dealer) have declared spades trumps, and that he, together with B's hand, have won eight tricks out of the thirteen, A and B score four points—two for each trick over six. Suppose that A have declared 'no trumps,' and that Y and Z together have won nine tricks, Y and Z score thirty-six points—twelve for each trick over six. When the hand is played, the score is marked on a sheet ruled in columns, one for each side, and divided by a horizontal line. A printed form, sold by all stationers, is most convenient, and is generally used. The points scored for tricks are marked *below* the horizontal line, as they are the only points which count towards the game.

When either side has won two games, all the points scored are added up, the stakes are paid by the losing side, the players cut again for partners, and begin a new game.

Besides the points scored for tricks, there are others which may now be enumerated:

A & B.	Y & Z.	A & B.	Y & Z.
16	40		
40	70		
8	16		
	80		
6			
72			
8	42		
32			
182	198		
100			
282			

Fig. 2.—Bridge Scoring Sheet.

Honours.—These are the ace, king, queen, knave, and ten of the trump suit. (In a 'no trumps' declaration the honours are the four aces.) They are counted for every hand. Simple honours, i.e. any three honours held by one side, count twice the value of the trick. Thus, if diamonds be trumps, and A and B together hold any three honours in that suit, they score twelve points. If either side together hold four honours, they score four times the value of the trick. Thus, if hearts be trumps, and Y and Z together hold any four honours in that suit, they score thirty-two points. If a player hold four honours in his own hand, his side scores eight times the value of the trick. If either side together hold all five honours, they score five times the value of the trick. If either side together hold all five honours, and one of them hold four honours in his own hand, they score nine times the value of the trick. If there are no trumps, the side which holds together three aces scores thirty points; and the side holding together four aces scores forty points. If any player hold four aces in his own hand his side scores one hundred points.

Chicane.—If a player hold no card of the trump suit his side scores twice the value of the trick.

Slam.—If either side win twelve out of the thirteen tricks in the hand, they score twenty points for *Little Slam*. If either side win all thirteen tricks in the hand, they score forty points for *Grand Slam*.

Rubber Points.—When either side has won two games they score one hundred points for the rubber. The scores for honours and chicane are computed on the original values of the tricks, and are not affected by any doubling after a declaration has been made.

Table of Bridge Scores.

	Trump Suit.				
	Spades.	Clubs.	Diamonds.	Hearts.	No Trumps.
For every trick over six	2	4	6	8	12
Simple honours (3) ..	4	8	12	16	..
Four honours	8	16	24	32	..
Four honours in one hand	16	32	48	64	..
Five honours	10	20	30	40	..
Five honours, four being in one hand ..	18	36	54	72	..
Three aces	..	..	..	..	30
Four aces	..	..	..	..	40
Four aces in one hand ..	..	..	..	..	100
Chicane	4	8	16	32	..

Little Slam ... 20 points. | Grand Slam ... 40 points.
Rubber 100 points.

The scores marked on fig. 2 are explained as follows:

First Hand.—A (the dealer) declares spades trumps, and holds the ace and queen. His partner (B) holds the knave and ten. A and B win nine tricks, and therefore score six points (3×2) below the horizontal line. They score also eight points for their four honours above the horizontal line.

Second Hand.—Y (the dealer) declares 'no trumps.' B says to his partner, 'May I play?' A replies, 'I double "no trumps."' Y and Z in turn say, 'Content.' Y and Z win four tricks, so that A and B win nine and score seventy-two points ($12 \times 2 \times 3$). Y and Z, however, held between them three aces, so score thirty points above the horizontal line. A and B have won the first game.

Third Hand.—B's deal. He leaves the declaration to his partner, who calls hearts. Y and Z do not double. A and B win seven tricks = eight

points. They hold between them all five honours (three in A's hand and two in B's), so score forty points above the line. Y had no hearts in his hand, so Y and Z score sixteen points for chicane.

Fourth Hand.—Z's deal. He declares diamonds, and his side win all thirteen tricks = forty-two points (7×6). Z held all five honours in his own hand, so that Y and Z score seventy points for honours and forty for the grand slam. Y and Z have won the second game.

Fifth Hand.—A's deal. He declares hearts. A and B win ten tricks = thirty-two points. A held three honours, B having none, so A and B score simple honours = sixteen points. A and B have won the third game and the rubber with a total of 182 points. To this they add 100 rubber points, making their total score 282 points. Y and Z have scored a total of 198 points, which, subtracted from 282, leave 84. If the stakes had been halfpenny points Y would pay to A 3s. 6d., and Z would pay to B 3s. 6d. It will be gathered from the above description that it is possible for one side to win the rubber and yet lose on points. This happens, as a matter of fact, not infrequently.

An elaborate series of Bridge rules has been compiled and adopted by authority of the Portland Club. They are too long to be given here, but are set out at length in most text-books. For instruction and advice on calling and on the play of the hand, the tyro is recommended to the guides by W. Dalton, 'Hellespont,' and the Bridge Manual of John Doe. In all treatises upon the game an elementary knowledge of Whist is postulated.

AUCTION BRIDGE.—A game of cards for four players; a variety of Bridge, which it has now superseded. The differences between the two games are in the methods of declaring and scoring. In Bridge the declaration must be made by the dealer or his partner; in Auction all four players compete in turn for the declaration. The points scored for tricks, honours, &c. are in most cases higher than at Bridge, so that the stakes are fixed usually on a lower scale. Auction at 1s. per 100 points is about equal to Bridge at 2s. 6d. Since its introduction many changes have been made in the game, and even now frequent suggestions are made for its alteration and improvement. The beginner should study the article on 'Bridge' above, as with knowledge of that game Auction will not present any difficulty.

Description of the Game.—The players cut for partners, and deal in turn as at Bridge. The dealer has first the right to declare, and the right to declare passes to each player in turn from right to left. Each declaration must, of course, exceed the previous one, and the play of the hand does not begin until competition ceases—i.e. until a declaration has been accepted by the other three players. As at Bridge, points are scored for each trick over six that is gained. When clubs are trumps, six points; when diamonds are trumps, seven points; when hearts are trumps, eight points; when spades or 'lilies' are trumps, nine points; when the call is 'no trumps,' ten points. It is obvious, therefore, that the call 'one diamond' exceeds the call 'one club,' the seventh trick when diamonds are trumps scoring seven points, against six points for the seventh trick when clubs are trumps. The call or declaration is, in fact, an engagement by one player to win with his partner a certain number of tricks in excess of six. 'One club' means: Clubs being trumps, my partner and I together engage to win seven tricks. If a player do not wish to compete for the declaration when his turn comes, he says 'No,' and the right to declare passes to the player on his left. Saying 'No' or 'Passing,' however, does not prevent a player competing if the turn comes round to him

again. The value of a declaration is assessed by the points it represents, 'one club' or six points being the lowest, and 'seven in "no trumps"' or seventy points the highest. If the points be equal the declaration involving the greater number of tricks is the higher. Thus, the declaration 'three clubs' or eighteen points is higher than 'two spades,' which is also eighteen points. The declarations in order of value are: One club; one diamond; one heart; one spade (spades are sometimes called 'lilies' or 'royal spades'); one 'no trumps'; two clubs; two diamonds; two hearts; two spades; three clubs; two 'no trumps'; three diamonds; three hearts; four clubs; three spades; four diamonds, and so on. In this connection an important rule should be noted: Each declaration must be higher than the preceding one. If a mistake be made, the player at fault must amend his declaration without changing the suit. For instance, A has declared 'two spades;' Y declares 'two hearts,' which is lower in value. Y must increase his declaration in hearts so as to make it better than 'two spades.' He must call, at least, 'three hearts,' and his partner, moreover, may not make another declaration unless the opponents do so. A declaration may be doubled as at Bridge, and the declaring player and his partner in turn have the right of redoubling. No further increase of the stake is permitted. The doubling of a declaration does not affect its value in competition with other declarations. If A call 'one spade' and Y double, B may call 'one "no trumps,"' or may make any other declaration involving more than nine points. The whole method of calling may be illustrated by a practical example: A, having dealt all the cards, looks at his hand and calls 'one diamond;' Y, the player on his left, calls 'one heart;' B calls 'no trumps;' Z says 'No;' A says 'No;' Y calls 'two hearts;' B says 'I double two hearts;' Y says 'Content;' Z says 'Content;' A calls 'three diamonds;' Y says 'No;' B says 'No;' Z says 'No,' and the game begins. Diamonds are trumps, and A and B between them are engaged to win at least nine out of the thirteen tricks. Once a declaration has been passed by the other three players, the game proceeds exactly as at Bridge, the player to the left of the caller playing first to the first trick. (Note in this connection that 'the caller' is the first caller of the accepted suit. If A call 'one diamond,' and, later, his partner B call 'three diamonds' and have the call, Y must play first to the first trick since A was the original diamond caller.) When the hand has been played, points are scored as at Bridge for tricks, honours, &c., but on a higher scale and in a different manner.

A Bridge scoring-form is used, but only the points gained for tricks by the declaring side are scored below the horizontal line. If the declaring side do not carry out their declaration, i.e. do not 'make their contract,' the other side score above the line fifty points for every trick short. Thus, if Y declare 'three clubs,' and he and his partner win seven tricks, they would be two tricks short or 'shy,' and A and B would score one hundred points above the line. If Y and Z had made their contract—had gained nine tricks—they would have scored eighteen points below the line. If the declaration have been doubled, the declaring side, if they make their contract, score double the ordinary number of points below the line. They also score above the line fifty points for making their contract and a further fifty points for every trick they gain in excess of their contract. Similarly, if the declaration have been doubled and redoubled, the declaring side, if they make their contract, score four times the ordinary number of points below the line, and score also above the line one hundred points for the contract and one hundred points for every addi-

tional trick they gain in excess of it. If the declaration have been doubled and the declaring side do not make their contract, the other side score above the line one hundred points for every trick short, or two hundred points if the declaration have been redoubled. For example, B declares 'three spades,' and is doubled. A and B gain ten tricks. A and B score seventy-two points below the line and one hundred points above, i.e. fifty points for their contract and fifty points for one trick in excess of it. Again, if B declare 'four clubs' and be doubled, and A and B gain six tricks only, i.e. are four tricks 'shy,' Y and Z score four hundred points above the line. The game is ended when either side have scored at least thirty points below the line, and the winning of two games by either side constitutes the rubber, as at Bridge. Honours are reckoned as at Bridge, and points are scored for them according to the original value of the trick (see table). The points scored for honours are not affected by any doubling; thus, simple honours in spades count eighteen points even though the declaration of spades may have been doubled or redoubled. Points for Chicane are scored as at Bridge. Grand Slam and Little Slam are reckoned as at Bridge, but higher points are scored.

Table of Scores at Auction Bridge.

	Trump Suit.			
	Clubs.	Diamonds.	Hearts.	Spades.
Each trick above six counts.	6	7	8	9
Simple (3) honours count...	12	14	16	18
Four honours count.....	24	28	32	36
Four honours in one hand count.....	48	56	64	72
Five honours count.....	30	35	40	45
Five honours (four in one hand) count.....	54	63	72	81
Five honours in one hand count.....	60	70	80	90
Chicane counts.....	12	14	16	18

When the declaration is 'no trumps'—

Each trick above six counts.....	10.
Three aces count.....	30.
Four aces count.....	40.
Four aces in one hand count.....	100.

Whatever be the declaration—

Little Slam counts.....	50.
Grand Slam counts.....	100.
Rubber counts.....	250.

Only points gained for tricks by the declaring side are scored below the horizontal line—i.e. they are the only points which count towards the game. A higher score includes a lower—i.e. the one hundred points for Grand Slam include the fifty for Little Slam; five honours in one hand in spades score ninety only; no additional points are scored for four or simple honours.

Literature.—The following text-books may be studied with advantage: *Royal Spades*, by Bascule; *Auction Bridge up to Date*, by W. Dalton; *Auction Bridge under the New Rules*, and *Master Auction*, by Florence Irwin; *Foster on Auction*.

Bridge (A.S. *bryeg*; Dutch *brug*; Ger. *brücke*) is a structure raised over a river, canal, road, valley, chasm, or other impediment, to connect the opposite sides, and form a passage across. To speculate on the absolute origin of bridges is unprofitable. The simplest, and no doubt the earliest, form of bridge is that by which a stream was crossed by laying a tree on two piles of stones, or on the banks, at opposite sides. The next step was probably a development of the simple log into a system of cantilever bridge, which afforded means of greatly increasing the span, as has for centuries been prac-

tised by Japanese bridge-builders. For spanning a stream of considerable width, they would lay two balks of timber, imbedding one in one bank, and the other in the other bank, with their ends projecting over the stream, so as to form two cantilevers, and would then add a centre balk reaching across from one to the other. A good bridge of this kind was one constructed across the mountain-stream flowing through Nikko, which, although it was built two hundred years ago, is known as the 'temporary bridge,' to distinguish it from the more elaborate structure crossing the stream near it, which has its approaches closed against all but imperial and aristocratic travellers. There is an ancient Indian cantilever bridge across the Sutlej, the side beams of which, 100 feet in length, are imbedded to the extent of 50 feet in the masonry of vertical abutments, leaving 50 feet projecting. On their ends rest a centre beam, with which the span is made up to about 200 feet.

But the skilful and intelligent construction of a permanent bridge, with a large number of blocks of stone, in combination, held together mainly by the force of gravitation, was a problem of another order: apparently outside the scope of the Greek forms of constructive design, when the people of Athens crossed the Cephissus by wading or ferrying. But it was thoroughly grasped by the practical genius of the Romans, to whom, by general consent, the adoption of the arch as a constructive feature in works of architecture and of engineering is attributed. The Roman bridges generally consisted of a level road supported on one or more semicircular arches, exemplified in the Ponte de Rotto, or Senators' Bridge (fig. 1), erected

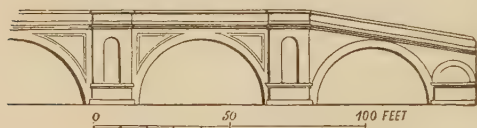


Fig. 1.—Ponte de Rotto.

by Caius Flavius, 127 B.C.—probably the first instance of the application of the arch in bridge design. The most remarkable bridge of antiquity was built by Trajan across the Danube, near Warkel, in Hungary, 4500 feet in length, 60 feet wide, consisting of twenty arches having a span of 170 feet, and 150 feet high from the foundations, constructed of squared stones. It was afterwards destroyed by Adrian, moved by jealousy probably, on the pretext that it would afford a passage for the barbarians into the empire. Some of the piers remain visible. The next considerable Roman work of this kind is the Pont du Gard, built in three stages, serving the double purpose of a bridge over the Gardon, and of an aqueduct for supplying the population of Nîmes with water. The bridge is 465 feet in length, and consists of six arches, which support a second series of arches, eleven in number, continued at each end to join the sloping sides of the mountains; and over these a third series, of thirty-five arches, much smaller than the lower arches, 850 feet in length, supporting a canal on a level with the mountains, 190 feet above the river. This unique structure was built with very large stones, worked with perfect accuracy to the required forms, and held together by iron cramps, without cement. It continues in a good state of preservation.

The semicircular arches of the ancients were succeeded by pointed arches, generally of small span; whilst in those of modern date the arches have generally been segmental—i.e. a segment of a circle less than a semicircle—or semi-elliptical. The

segmental and elliptical forms are in general much the more suitable, as they combine wide spans and free waterway with moderate elevation. But they incur a much greater lateral thrust on the piers and abutments than the semicircular arch, which must of course be provided for in proportioning the form and mass of the supporting elements.

The Gothic 'triangular' bridge of Croyland, more



Fig. 2.—Croyland Bridge in 1790.

properly 'trefoil' or three-way bridge (fig. 2), now usually called 'Trinity Bridge,' was built apparently about 1380 by the then abbot of Croyland in Lincolnshire (q.v.). It was erected at a point where a branch from the main stream of the Welland ($1\frac{1}{2}$ mile distant) divided into two smaller branches; and its three arches provided for three watercourses and three roadways. But it could never have been intended for heavy traffic, as it is too steep and too narrow for any vehicle. In 1854 the stream passing beneath, then become a common sewer, was arched over; and the bridge is now high and dry. On three piers or abutments arranged in a circle at the apices of an equilateral triangle, three semi-arches rise and meet in the middle—every two semi-arches balanced by the third. The longest bridge built in England in medieval times, was that over the river Trent, at Burton in Staffordshire, erected in the 12th century, of freestone, consisting of thirty-six arches, and 1545 feet long. It was superseded by a new bridge in 1864.

One of the most interesting bridges in the world is the bridge over the Taff, on the road from Llantrissant to Cardiff and Merthyr, which crosses the Taff at the village of Newbridge. It is named the 'Pont-y-tu-Prydd,' or Pontypridd, which means literally 'bridge by the earthen house,' derived from a mud hut that stood near the site. It was first determined to erect a bridge at a spot lower down the river; and William Edwards, a country mason, undertook the work, which was commenced in 1746. The bridge consisted of three arches; but two years and a half after it was finished, it was swept away during one of the great floods to which the Taff, like other rivers in mountainous districts, is subject; the water rising to so great a height as to flow over the parapet. Edwards, to guard against the danger which led to the destruction of the first bridge—the obstruction of the channel by the piers—conceived the bold design of spanning the river with a single arch of 140 feet span. The second bridge had barely been completed, when by another, but very different accident, the bridge fell like its predecessor. The quantity of material in the centre of the arch was so limited in proportion to that laid over the spandrels or haunches, that the deadweight on the haunches forced up the crown of the arch; and, again, the whole was reduced to ruins. After this second failure, most men would have relinquished the attempt. Not so with Edwards, who, per-

severing and ardent, determined on a third effort to overcome the difficulty. He rebuilt the bridge in conformity with the second design of a single arch; and profiting by experience, he adopted the precaution of greatly reducing the deadweight on the haunches, by making in each spandril three through transverse cylindrical openings, from face to face of the bridge; and, in addition, he filled the internal spaces between the faces with charcoal, a material weighing not more than one-fourth of rubble stone, bulk for bulk. By this means, a permanent structure, finished in 1750, was reared, which has now lasted nearly 150 years. The arch is a segment of a circle; it measures 140 feet wide between the abutments, as already stated, and has a rise of 35 feet. The arch is not parallel faced, but is 14 feet 5 inches wide at the crown, widening to about 16 feet wide at the springing, or the abutments. This expanding form is an element of stability. The roadway is 11 feet wide at the crown. From the great rise of the arch, the roadway over it was uncommonly steep and even dangerous; and about 1830, the roadway was raised at each end, and the surface was paved. But even now it is so steep—the inclination being at the rate of 1 foot rise in 4 feet horizontally—that it is found necessary to use a chain and drag, so that when a carriage reaches the centre of the bridge, one end of the chain is attached to the hinderpart of it, the other end being secured to the drag, upon which a boy generally places himself, so that as the carriage descends upon one side, the drag is pulled up on the other side, and thus relieves the horse in descending. Edwards erected several other bridges in South Wales. With the occupation of a mason he combined that of a Methodist minister, having preached for upwards of forty years at White Cross Chapel, in his native parish.

The nature of the arch, with definitions, has already been noticed in the article ARCH. Each stone of an arch is acted on by three forces, one of which, its proper weight plus the weight of the load above it, is vertical. The second and third, the pressure of the two contiguous stones upon it, are perpendicular to the surface of contact with these stones. The nature of the stress everywhere is essentially compressive—that is to say, every individual stone acts and reacts by simple pressure—the result of gravitation. When every portion of the arch is equally stressed, no part tending to yield before another, it is in a perfect state of equilibrium. But, as says the old proverb, 'an arch never sleeps'—always ready for a fall—and if too great a load be placed on the crown of the arch, it will open outwards at the haunches, and sink inwards at the crown. If, on the contrary, there be a deficiency of weight at the crown, the crown will open upwards, and fall in at the haunches, as happened in the case of the second Pontypidd.

It is readily conceived that the higher the rise of the arch in proportion to the span, the less intense proportionally is the stress in its component parts, the less injurious is any slight inaccuracy of workmanship or design likely to prove, and the easier is the work of construction. But the inconvenience of the steep slopes resulting from a great proportionate rise of the arch, in situations where the approaches are low, has enforced the adoption of the lowest practicable rise and a low elevation of the roadways of bridges—segmental or semi-elliptical in form, as before stated.

The celebrated Grosvenor Bridge over the river Dee at Chester (fig. 3) supplies a fine example of a segmental arch of large span. The old bridge connecting Chester with a suburb, Handbridge, first noticed in the 13th century, is recorded to have fallen down or

been carried away twice. The third erection was of stone, in 1280, consisting of seven arches, pointed Gothic, supported on huge piers or buttresses. The old bridge has been aptly described by Ormerod, as 'a long fabric of red stone, extremely dangerous and unsightly, and approached by avenues to which the same epithet may be safely applied.'

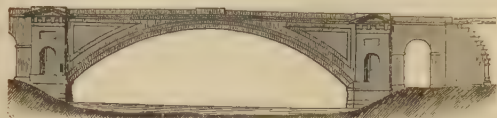


Fig. 3.—Grosvenor Bridge.

The new bridge was designed by Mr Harrison, a local architect. It consists of one arch of 200 feet span, and 42 feet of rise—a segment of a circle of 140 feet radius. The total length is about 345 feet, and the clear width of roadway is 33 feet. It is below the old bridge, and stretches from the rock below Chester Castle towards the village of Overleigh. The abutments are founded on the solid rock, except where a fault occurs from the rock dipping almost vertically, at the back part of the north end, and where filling was necessary. So soft was the material with which the fissure was filled, a kind of quicksand, that the piles went down 5 or 6 feet at a blow for a considerable depth. A floor of stone was laid on the head of the filling, and the abutment was built upon it. The arch stones are 4 feet deep at the crown, and gradually increase to 6 feet at the springing. The radiating courses of stones on the principle of the arch is carried through the abutments, even down to the foundations; and the rock itself becomes the actual abutment as shown in fig. 4. The bridge was constructed of native sandstone, excepting the faces of the abutment and the first two courses of the arch, which are of granite.

The centering (fig. 4) on which the stupendous arch was raised consisted of six ribs in width of fir timber. The span of the arch was divided into four spaces by means of three nearly equidistant piers

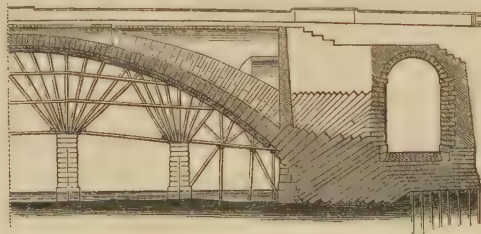


Fig. 4.—Centering of Grosvenor Bridge—Half Length.

of stone built in the river, from which the timber spread fan-like towards the soffit or under face of the arch, where they were bound together with thick planking bent round to the curve of the arch. On the rim thus formed, the lagging or covering to form the bed on which the stones were laid was supported over each rib by wedges, by means of which the bed could be adjusted to the true curve, and which were driven out when the bridge was completed in order to remove the centering. The framing of the centering was composed entirely of whole and half timbers, from 22 to 36 feet in length; and, in all, the centre used up 10,000 cubic feet of timber. The effectiveness of the system adopted was proved by the circumstance that half of the arch was turned before the centre was finished; and that on its removal, the crown of the arch sank only from $2\frac{1}{2}$ inches to $2\frac{3}{8}$ inches,

the joints remaining perfectly close, and no derangement of form, or of 'spaulching' or cracking being perceptible. The cost of the centering did not exceed £500.

The Grosvenor Bridge was constructed in the course of five years, and was opened in 1832. The total cost of the work was £49,900, which included a sum of £7500 for the embankment forming the approaches, or £145 per lineal foot.

The Adolphe Bridge in Luxembourg is a masonry bridge with an arch having a span of 278 feet, the longest built up to the present date. The arch has a rise of 138 feet above the river.

John Rennie led the way to the adoption of semi-elliptical bridges. His first important bridge—across the Tweed, at Kelso—opened in 1803, consists of five semi-elliptical arches of 72 feet span, with a rise of 28 feet, and four piers 12 feet thick, with a level roadway 23½ feet wide between the parapets, and 29 feet above the ordinary surface of the river. The foundations were laid on solid rock. The piers and abutments are ornamented with three-quarter columnar pilasters of the Roman-Doric order, surmounted by a plain block-cornice and balustrade of the same character. Kelso Bridge, as Dr Smiles observes in his *Lives of the Engineers*, may be regarded as the model of the greater work by the same engineer—Waterloo Bridge. It was, he adds, one of the first bridges in this country constructed with a level roadway, contrasting vividly with the old-fashioned bridges, sloped like the roof of a house, as, for instance, the Pontypridd already noticed.

Waterloo Bridge, across the Thames, designed by John Rennie, has a level roadway, carried on nine equal semi-elliptical arches, of 120 feet span each, and 32 feet rise, leaving a clear height of 30 feet above high-water spring-tides. It was built of granite, in a style of solidity and magnificence previously unknown. Inverted arches were built between the elliptical arches in order to counteract the lateral pressure. The elliptical arch was carried to a greater extent of flatness than in bridges previously built. Isolated cofferdams upon a great scale, in a tidal river, with steam-engines for pumping out the water, were employed in the building of this bridge, for the first time, it is believed, in Britain. The length of the bridge between the abutments is 1380 feet, and the width between the parapets is 42 feet 4 inches. The long inclined approach on the Surrey side is formed by a series of thirty-nine semicircular arches of 16 feet span, besides an elliptical arch, of 26 feet span, over the Narrowwall Road, and an embankment 165 yards long, on an inclination of 1 foot rise in 34 feet of length. The total length of the bridge, with approaches, is 2456 feet, or nearly half a mile.

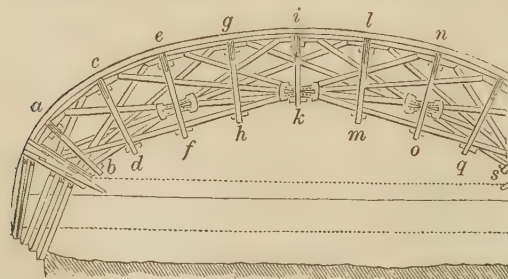


Fig. 5.—Centering of Waterloo Bridge.

The bridge was finished in 1817. The centering employed in the erection of the arches is illustrated by fig. 5, and is an excellent example of centering supported at the piers. It may be observed that the loads on the upper face of the centering are

resisted by oblique struts passing to the right and to the left, finally taking their bearing on the base of the piers. At each of the points *c*, *e*, *g*, &c. a pair of oblique struts is placed to take the thrust, one of them resting on a pier, the other lodged in the central shoe, *k*, and opposed by the corresponding strut from the other half of the arch. When the centres were struck, the sinking of the arches did not exceed from 2½ to 3¼ inches at the crown.

New London Bridge (fig. 6), across the Thames, was built 180 feet higher up the river than the old bridge. It consists of five semi-elliptical arches, the least of which is wider than any other elliptical arch ever before erected. The centre arch has 152½ feet span, with 37½ feet rise; the next two arches are of 140 feet, and the two abutment arches are of 130 feet span. The roadway is 52 feet wide. The clear waterway at all times of the tide is 692 feet, or 60 feet more than the old bridge afforded at high-water. The whole length of the bridge is 1005 feet. At the City side the bridge is carried

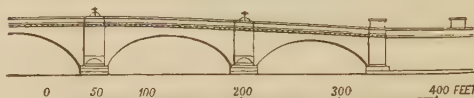


Fig. 6.—London Bridge—Half Length.

over Thames Street on a dry arch. At the Borough or south side the approach is formed on an inclined plane, supported on a series of brick arches, with a large dry arch facing Tooley Street. This bridge deserves further remark for the difficulty of the situation in which it was built, above the old bridge, in a depth of from 25 feet to 30 feet at low-water, on a soft alluvial bottom, covered with large, loose stones, scoured away by the force of the current from the foundations of the old bridge. The whole of these stones had to be removed by dredging before the cofferdams for the piers and abutments could be commenced; otherwise it would have been extremely difficult, if not impracticable, to have made them watertight. The difficulty was further increased by the old bridge being left standing, to accommodate the traffic whilst the new bridge was building, and the restricted waterway of the old bridge occasioned such an increased velocity of the current as materially to retard the operations of the new bridge. At times the tide threatened to carry away all before it; and it was found expedient that two of the small arches of the old bridge on each side should be thrown into one, to compensate for the additional obstruction which the water occasioned to the navigation. The piers and abutments stand upon platforms of timber, the floors of the cofferdams resting upon piles about 20 feet long. The masonry is from 8 feet to 10 feet below the bed of the river. The great magnitude and extreme flatness of the arches, of which the keystones are 4 feet 9 inches long, demanded unusual care in the selection of the materials, which were of the finest blue and white granite from Scotland and Devonshire, as well as great accuracy of workmanship. The new bridge was opened for traffic in August 1831, the period occupied in its erection, from the time of driving the first pile for the dam of the south pier, being seven years, five months, and thirteen days.

Between 1902 and 1904 a scheme for widening the bridge was carried out, the footways being now carried by granite corbels. The present width of roadway is 35 feet, and each footway has a width of 15 feet, making the total width between the parapets 65 feet.

In the following table are given the leading dimensions of the largest stone arches that have been built for common roads, from 150 feet of span upwards :

Name.	River.	Form.	Span.	Rise.	Keystone.	Date.	Engineer.
Claix (Grenoble).....	Drac.....	Circular.....	150	feet.	ft. in.	1611	
Gloucester.....	Severn.....	Elliptical.....	150	54	3 1	1827	Telford.
London.....	Thames.....	Elliptical.....	152	37½	4 6	1881	Rennie.
Tournon.....	Doux.....	Circular.....	157	65	4 9	1854	
Verona.....	Adige.....	Elliptical.....	160	53		1854	
Lavaur.....	Agout.....	Elliptical.....	160	65	10 9	1775	Saget.
Gignac.....	Hérault.....	Elliptical.....	166	44	6 5	1798	Garipuy.
Vieille-Brionde.....	Allier.....	Circular.....	178	69	5 3	1454	Grenier and Estone.
Chester.....	Dee.....	Circular.....	200	42	4 0	1882	Hartley.
Washington Aqueduct	Cabin John Creek.		220				Meigs.
Adolphe.....			278	102	4 8	1903	

The development of the railway system, with command of plenty of capital, afforded opportunities for the construction of bridges on a grander scale than for common roads. The largest railway bridges usually cross rivers or canals, the smaller bridges provide for passing over or under local roads, and for field communication; as a result of this latter fact the number of bridges required on a railway is much greater than on a corresponding length of highway.

The brick bridge over the Thames at Maidenhead, on the Great Western Railway, designed by Mr I. K. Brunel, supplies a remarkably daring instance of wide spans, combined with a low rise of arch. It consists of a central pier and two main arches, flanked at each end by four openings for the passage of flood-water. The main arches are elliptical, 128 feet span, with a rise of 24½ feet only. The land arches are semicircles, 28 feet in diameter. The central pier stands in the middle of the river upon a shoal which provided a good foundation, whilst the deep waterway was left free for navigation. The low rise of the arches was imposed by the condition of the gradients.

With the railway system, nevertheless, the semicircular stone arch has been revived in bridges as well as in viaducts. One of the most imposing structures of this class, forming part of the Glasgow and South-Western Railway, is the Ballochmyle stone viaduct (fig. 7), over the river Ayr, which



Fig. 7.—Ballochmyle Bridge.

spans the river by a semicircular arch of 180 feet span, founded on rock—the largest span of railway masonry in Britain or elsewhere—with six auxiliary arches of 50 feet span. The arch stones of the central arch are 4½ feet broad. The centering of timber erected for the construction of this arch was a masterpiece of carpentry, well worthy of careful study. Its principal members were composed of 14-inch square balks, carried up from the bed of the river, well braced by diagonals, especially transversely, as the height was very great in proportion to the width. Rails were laid at the upper part of the framing to carry the traversing cranes employed in the construction of the arch. The highest point of the centering stood 157 feet 4 inches above the bed of the river. The level of the rails on the viaduct is 167 feet high.

The Congleton Viaduct, on the Manchester and Birmingham Railway, is amongst the longest in Britain. It is of stone, 1026 yards, or more than half a mile in length, and 106 feet high. It cost £113,000, or £113 per lineal yard. The Dane Viaduct, on the same line, is of brick, 572 yards long, 88 feet high; and it cost £54,000, or £95 per

lineal yard, having 23 arches of 63 feet span. On the railway lines entering London and other large cities and towns there are miles of brick viaducts. On the Vincenza and Venice Railway there is a viaduct (1845) of stone and brick, by which the Laguna Veneta is crossed, consisting of 222 arches, and 12,000 feet, or more than two miles long. Thus is Venice, the ocean city, chained to the mainland.

Timber bridges, or frame bridges, as they are occasionally called, are in Britain never now employed for railway work by reason of their want of durability, and on account of the much heavier loads imposed on bridges by modern rolling-stock. Such railway bridges as have in earlier times been built of timber in Britain have been reconstructed of stone, brick, iron, or steel. Nevertheless, timber bridges are in some situations, in new and poor countries, practically the only works available where timber is abundant and cheap. Timber bridges and viaducts on a large scale were built in the United States of America for road and railway purposes down to about 1850, from which date metal trusses began gradually to entirely supersede timber structures. The 'inflexible arched truss,' introduced by Mr D. C. McCallum, has probably been in more general use in the States than any other system of timber bridge. It is illustrated in fig 8, showing one-half of a railway bridge of 200 feet span, 15 feet wide in the clear for a single line. The depth of the truss is 26 feet at the centre, 21 feet at the ends. Its cost is said to be from £6 to £8 per lineal foot. Some of the timber viaducts

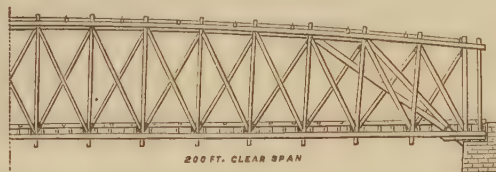


Fig. 8.—Inflexible Truss Bridge—Half Length.

were carried on timber piers of exceptional height; the Genesee Viaduct had trestle piers 190 feet high.

Cast-iron Bridges.—Towards the close of the 18th century some bridges were erected, the arches of which were constructed mainly of cast-iron. The first of these structures was the bridge over the Severn, near the town of Ironbridge, erected by Mr Darby, of Coalbrookdale Ironworks, in 1779. The bridge consisted of a single arch, nearly semicircular, of 100 feet span. The most celebrated bridge of cast-iron was the old Southwark Bridge across the Thames, designed and erected by Mr Rennie, opened in 1819. It consisted of three cast-iron arches with stone piers and abutments, the central arch having a span of 240 feet and the two side arches spans of 210 feet. The traffic having become too great for the old bridge, it was replaced by a new bridge which was completed and opened for traffic in 1921. Temporary foot bridges for pedestrian traffic having been

erected, the old bridge was completely closed to the public on 4th November 1913, and the work of demolition at once begun. On the city side the gradient of the approach to the old bridge was about 1 in 18; for the new bridge the gradients have been reduced to 1 in 37 on the city side and 1 in 46 on the Southwark side. The new bridge was designed by Messrs Mott & Hay, and the contractors were Sir William Arrol & Co. of Glasgow. The new bridge has five spans, the central opening is 140 feet 6 inches wide, the two intermediate openings 131 feet 9 inches, and the two shore openings 123 feet. The openings are spanned in each case by seven steel arched ribs spaced 8 feet 9 inches centres, except the outer pair on each side, which are 5 feet centres. The total width of the bridge between the parapets is 55 feet. There are two footways of 10 feet each and a roadway of 35 feet. It is interesting to note that the caissons used for the pier foundations were the largest yet made in this country, two of them being 102 feet by 30 feet in cross-section. (For description of this new bridge, see *Engineering*, vol. 99, p. 479.)

The high-level bridge over the deep ravine through which the Tyne flows between Newcastle

and Gateshead is a unique structure in cast-iron, a fine example of the bow-string arch. It formed the junction between railways from York and from Berwick, then separate (now the London and North-Eastern main line). It was proposed by Mr Hudson, the railway king, and designed by Mr Robert Stephenson and Mr T. E. Harrison. There are two roadways—one for carriages and foot-passengers, level with the Castle-garth, and the other, 22 feet above it, for railway traffic. The bridge consists of six spans of 125 feet each; the piers, 16 feet thick, being of masonry, the arched ribs of cast-iron, and the ties of wrought-iron. The soffit or under side of the roadway is 83 feet above high-water. The total height of the piers is 131 feet from the foundation. The carriage-road is 1380 feet in length—about a quarter of a mile. It forms one of the most striking features of the bridge.

It is suspended from the upper or railway roadway. There are 4728 tons of cast-iron in the bridge, and 321 tons of wrought-iron. The bridge cost £243,000, or, say, £176 per lineal foot. It was opened by Queen Victoria in 1849. The first difficulty in building the bridge was to secure a good foundation for the piers. The first pile was driven to a depth of 32 feet in four minutes; and as soon as one was placed, the traveller hovering overhead presented another, and down it went, like a pin into a pin-cushion. When the piles had been driven and the cofferdams completed, the water was pumped out. But though powerful engines were employed, it forced itself through the bed of quicksand as fast as it was removed. Every effort was made for months to overcome it, but without success, until at last a bed of cement-concrete was laid in, a foundation was made, and the piers were built.

This bridge is historically interesting, as it shows a transitional form intermediate between the arch and the girder—between cast-iron structures and wrought-iron structures (see also the article NEWCASTLE).

Wrought-iron Bridges.—The unsuitability of cast-iron as a material for bridges of very large span—long-span bridges, as they are called—raised the question of the sole employment of wrought-iron as the material for the crossing of the Conway and the Menai Strait, on the line of the Chester and Holyhead Railway, involving spans of 400 feet and upwards. The maximum existing span in cast-iron—that of Southwark Bridge—did not exceed 240 feet; and for the greater spans Mr Robert Stephenson conceived the idea of wrought-iron tubes for crossing the Conway River and the Menai Strait in large spans, through which railway trains were to be conducted. Sir William Fairbairn devised and conducted the preliminary course of experiments required for the purpose of testing by models the strength of such a structure, with others of elliptical and rectangular section for comparison. Rectangular tubes had the advantage in point of strength, and a model beam accordingly was constructed, to a scale of one-sixth of the proposed bridge. It bore the test most satisfactorily, and showed that the proposed tube could be made self-supporting over the desired span of 460 feet. Arrangements were accordingly made for the erection of the colossal structure itself. The

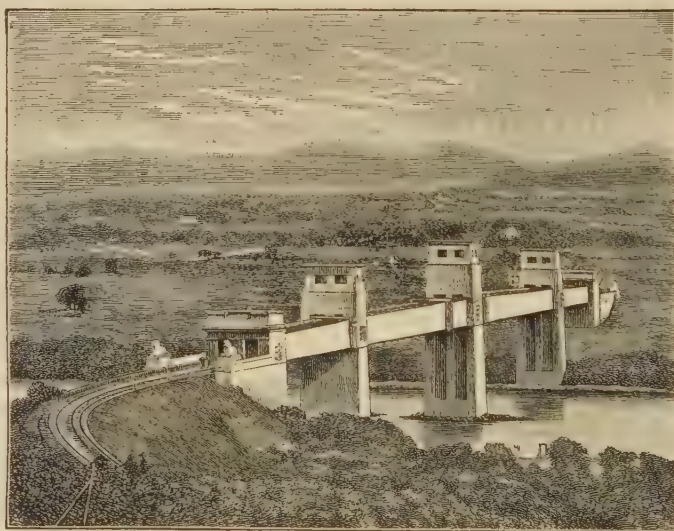


Fig. 9.—Britannia Bridge.

Britannia Bridge (fig. 9), so called after the Britannia Rock on which the central pier rests, was built across the Menai Strait. It consists of two independent continuous wrought-iron tubular beams, 1510 feet in length, weighing 4680 tons each, independent of the cast-iron frames inserted at their bearings in the towers. They rest on two abutments and three towers of masonry at a height of 100 feet above high-water. The middle, or Britannia, tower, 230 feet high, is built on a rock in the middle of the strait. The bridge is thus in four spans, of which there are two spans of 460 feet over the water, and two spans of 230 feet over the land. The weight of one of the longer spans, single tube, is 1587 tons, and that of one of the shorter spans 630 tons. The average weight of a single tube is over three tons per lineal foot of advance. A transverse section of each tube is shown by fig. 10. The chief mass of the material is placed at the top and the bottom, represented by the upper and lower flanges or tables of an ordinary beam, the two sides serving to connect the top and the bottom. Constructed

of plate-iron, the top requires more metal than the bottom, in order to resist the buckling stress to which it is subject. But instead of putting the metal into one thick plate, or into several plates laid one on another, it is constructed to form a set of small tubes or cells, which give additional stiffness and strength to the whole tube. The floor, in like manner, contains cells.



Fig. 10.

Each tube is straight on the lower face, and slightly curved on the upper face, inasmuch that the height of the tube externally is 30 feet at the middle in the Britannia Tower, and 26 feet internally, and 22 feet 9 inches and 18 feet 9 inches at the extremities in the abutments. The width of each tube externally is 14 feet 8 inches, and 13 feet 5 inches clear inside. The side plates are from $\frac{1}{2}$ inch to $\frac{3}{4}$ inch in thickness; the top plates are from $\frac{3}{4}$ inch to $\frac{1}{2}$ inch, for resisting compression; and the bottom plates are from $\frac{7}{8}$ inch to $\frac{1}{2}$ inch thick, for resisting extension. The tubes repose solidly on the centre tower, but on the land towers and abutments they repose on roller beds, thus permitting free expansion and contraction according to the temperature. The daily variation of length is from $\frac{1}{2}$ inch to 3 inches for the whole length of the tube, the extremes of the movement being attained at about 3 P.M. and 3 A.M. The effect of sunshine in deflecting the Britannia Bridge, as observed by Mr Edwin Clark, is very curious. A short spell of sunshine on the top of the tube raised it on one occasion nearly an inch in half-an-hour, with a load of 200 tons at the centre, the top plates of the bridge being expanded by increase of temperature, while the lower plates remained at constant temperature by radiation to the water beneath them. In like manner, the tube was drawn sideways to the extent of an inch by the sun shining on one side, and it returned immediately to its normal position as clouds passed over the sun. The tubes sometimes move as much as 2 $\frac{1}{2}$ inches vertically or horizontally when the sun shines on them. The tube is in fact a most delicate thermometer, in constant motion, both vertically and laterally. The Britannia Bridge was opened in March 1850 by the passage through it of three powerful locomotives with tenders. The second experimental train that went through consisted of twenty-four heavily laden coal-wagons, aggregating 300 tons weight. The train was drawn through the tubes at leisurely speed. During the passage a breathless silence prevailed, and when the train emerged at the other end the event was announced by great cheering, mingled with the reports of pieces of ordnance. One can imagine the relief from intense anxiety to the engineer. 'Often at night,' said Mr Stephenson, 'I would lie tossing about, seeking sleep in vain. The tubes filled my head. I went to bed with them, and got up with them. In the gray of the morning, when I looked across Gloucester Square, it seemed an immense distance across to the houses on the opposite side. It was nearly the same length as the span of my tubular bridge.'

A similar tubular bridge across the Conway, on the line of the Chester and Holyhead Railway, was designed and erected by Mr Stephenson. It consists of two tubes, each of one span of 400 feet, and was opened for traffic in May 1848.

The Victoria Railway Bridge (1854-59) over the

St Lawrence River, at Montreal, Canada, was tubular in design, like the Britannia Bridge. It is 9144 feet, or nearly 1 $\frac{3}{4}$ miles in length, in twenty-four spans of 242 feet, and a central span of 330 feet. The total length of each of the tubes was 6592 feet; and there were 9044 tons of iron in the tubes, or about 1 ton per lineal foot. In 1898-99 it was reconstructed and enlarged as a truss bridge. The river is 8660 feet, or about 1 $\frac{3}{4}$ miles wide at the crossing, where it descends at the rate of 7 miles per hour. The bridge is remarkable chiefly for its ice-breaking piers, which are constructed with large bows at the up-river ends to resist the enormous pressure of the ice in spring. The rails are 60 feet above the level of the river.

Although tubular bridges are not likely to be constructed in the future, it should be remembered that it was in tubular bridges that the first attempt was made to introduce wrought-iron in long spans upon railways. This was done by Mr Stephenson at a time when perhaps it would not have been in the power of any other man to influence the introduction of wrought-iron in such structures. The experience of the tubular bridge, nevertheless, led to a development of plate-iron girder bridges, in which the cellular principle of the tubular bridge has been applied in the designing of the longitudinal girders or beams between which the roadway is carried. The early forms for such girders are typified in the wrought-iron girders of the Torksey Bridge, Lincolnshire, erected in 1850. The bridge is constructed of two spans of 130 feet each. The girders are of uniform depth—10 feet. The upper boom or member of each girder is cellular, being the form best adapted to resist compression, and is constructed of plates $\frac{3}{4}$ inch and $\frac{1}{2}$ inch in thickness. The lower boom is not cellular like the top, as it is exposed only to tensile stress, and is constructed of plates $\frac{3}{4}$ inch and $\frac{1}{2}$ inch thick, riveted together. The two side plates, enclosing a hollow space, are made of $\frac{1}{2}$ -inch plates. Plate girders are now only used when the bridge to be built has spans which do not exceed about 100 feet.

Lattice-girder Bridges.—The lattice bridge—so called from having sides constructed with cross-bars, like lattice-work—is the natural outcome of the tubular bridge for long spans, developing equal strength with considerable economy of material and labour.

Lattice bridges of timber were first used in America, where timber is cheap. The first lattice-girder in iron was designed by Sir John MacNeill, and erected in 1843 on the line of the Dublin and Drogheda Railway, near Dublin, of 84 feet span.

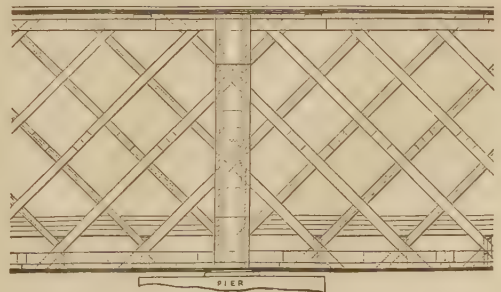


Fig. 11.

Lattice-girders are now almost universally adopted for steel bridges for long spans. Amongst the earliest of them is the lattice bridge forming a portion of the Boyne Viaduct on the line of the Dublin and Belfast Junction Railway, near

Drogheda, completed in 1855. It has three large openings, of which the middle span is 264 feet long, and the side spans 138 feet. There are two side girders $26\frac{1}{2}$ feet deep, $24\frac{1}{2}$ feet apart, connected by cross girders of lattice-work above and below—forming a rectangular enclosure, within which, on a platform, two lines of rails are laid on which the trains run. Each of the lattice-bars is crossed by six others at the angle 45 degrees, forming squares (fig. 11).

The King Edward VII. Bridge, Newcastle-on-Tyne, is an excellent example of the lattice type girder bridge of modern design. The main line

of the North-Eastern Railway was carried across the river Tyne by the old high-level bridge already described. This bridge provided for three lines of railway, and for nearly sixty years the whole railway traffic of the district had to be worked over these three lines. The traffic having increased beyond the limits of these three lines, the railway company decided to construct a new high-level bridge with four lines of railway, and an act of parliament was obtained in 1899. The new bridge is 710 yards west of the old structure, and the site was so chosen that trains from London could enter Newcastle Central Station at one end

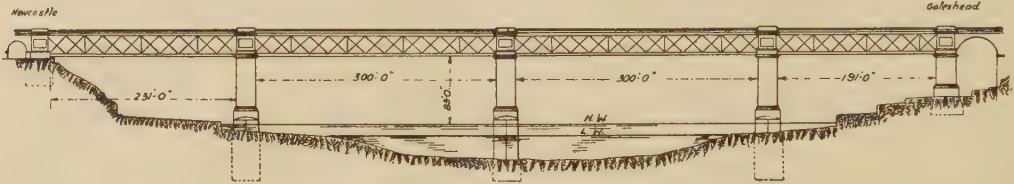


Fig. 12.—King Edward VII. Bridge.

and proceed north from the opposite end of the station, thus obviating the old arrangement by which trains had to enter and depart at the same end of the station. The new bridge was designed by Dr Charles Harrison, engineer to the northern division of the North-Eastern Railway, and the contract for the work was let in 1902 to the Cleveland Bridge and Engineering Co., Darlington. The cost of the bridge and approaches, exclusive of the cost of land and permanent way, was about £500,000.

There are three main piers in the river, the third pier being in the centre of the river-channel. The north land span is 231 feet long, the two river spans are each 300 feet long, and the south land span ranges from 174 feet 6 inches to 205 feet. The height of the two river spans is 84 feet above high-water of ordinary spring tides, and the main girders are of lattice design, the north land span and the two central spans being similar. There are five main girders to each span; in the two central spans each main girder is 308 feet long and 27 feet deep over the angles of the booms, the booms being 5 feet 6 inches wide and 3 feet deep. The south end of each girder is free to expand. The total weight of one 300 feet span is 1635 tons, or, inclusive of the bearings, 1736 tons.

Fig. 12 shows a side elevation of the structure, and the figure indicates clearly the type of lattice-girder employed in the bridge.

The three river piers are carried on caissons, the sinking of which was carried out under compressed air. The caissons were constructed of mild steel, the thickness of the outer plates of the shell varying from $\frac{1}{2}$ inch to $\frac{3}{4}$ inch. The area of all three caissons was 3361 square feet over the outside of the cutting edge, the height of the permanent part varying according to the level of the river-bed, the south caisson being 54 feet high, the centre caisson 26 feet 6 inches, and the north caisson 56 feet. The interior of the caissons was filled eventually with concrete, in the case of the south caisson the weight of the concrete being about 10,000 tons. The cement concrete in the caissons finished at the river-bed level, and from this point upwards the piers are constructed of granite masonry, and are 103 feet 6 inches by 30 feet 6 inches in cross-section at the bottom. (See *Minutes of Proceedings Inst. C. E.*, vol. clxxiv. p. 158.)

American Quadrangular Girder Bridges.—One of the best examples of American long-span iron-bridge construction (fig. 13) is the bridge across the Kentucky River on the Cincinnati Southern Railway, designed by Mr C. Shaler Smith—

noteworthy for the economical design and comparatively light weight. The ironwork of the bridge is 1138 feet in length, and it consists of three spans of 375 feet each. It crosses a limestone cañon at a height of 280 feet above the bed of the stream. The piers are of stone to a height of 60 feet, to clear the highest recorded floods; and they are about 34 feet thick at the flood-level. Above the stonework the piers are of iron. The truss or girder is rectangular in section, $37\frac{1}{2}$ feet high, 18 feet wide, consisting of top and bottom pairs of booms, forming the corners, united by panels or frames at intervals of $18\frac{3}{4}$ feet longitudinally, stiffened and bound with diagonal tie-rods. The booms each consist of flat plates placed vertically, riveted together. The piers consist of hollow pillars of

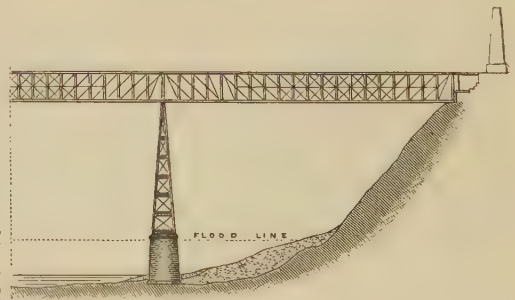


Fig. 13.

Bridge across the Kentucky River—Half Length.

plate-iron riveted together in box form. The diagonal rods are 'pin-connected'; that is to say, they are connected to the framework with cylindrical pins, a form of connection much practised in the States. The bridge was completed in February 1877. The expansion and contraction of the bridge operate each way from the centre, bending the tops of the piers correspondingly towards or from the shores—the greatest observed movement being half an inch either way. The ends of the girder rest by means of rollers on the abutments, and they have a maximum of 3 inches of travel resulting from variation of temperature. The ironwork of the bridge weighs 1631 tons, or 1.43 tons per lineal foot—less than half the weight per lineal foot of the tubes of the Britannia Bridge.

The Ohio Bridge on the Cincinnati and Covington Railway is a remarkable illustration of the application of the lattice-girder type of construc-

tion—its central span is 545 feet, and the two side spans are 490 feet. The three spans weigh about 5000 tons, and the bridge carries two lines of rails, two roadways, and two footways. It was built in 1888.

Cantilever Bridges—The Forth Bridge.—The principle of the cantilever bridge has already

been noticed as applied primitively in Japan and India, and in China also. A cantilever is, as Baker has said, a bracket; a structure overhung from a fixed base. The bridge across the river Forth (fig. 14), on the North British Railway system, opened by the Prince of Wales, 4th March 1890, is the largest and most magnificent bridge in the world. The engineers were Sir John Fowler, K.C.M.G., and Sir Benjamin Baker. The site of the bridge is at Queensferry. At this place, the estuary of the Forth is divided by the island of Inchgarvie into two channels, whose depth, as much as 200 feet, precluded the construction of intermediate piers. Hence, two large spans of 1700 feet each were adopted. Between these, the central pier is founded on the island midway across, and is known as Inchgarvie pier. There are two other main piers—shore-piers—known respectively as the Fife pier and the Queensferry pier. On these three piers respectively three double lattice-work cantilevers (fig. 15), like scalebeams,



Fig. 14.—General View of the Forth Bridge (looking up the river).

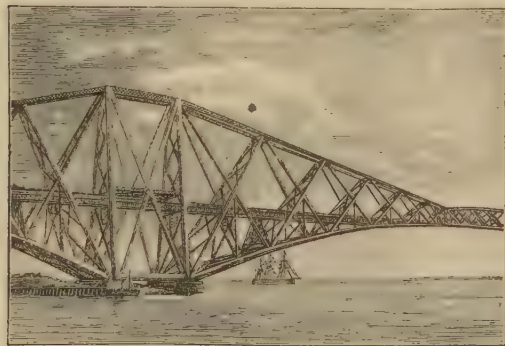


Fig. 15.—One of the Cantilevers of the Forth Bridge.

1360 feet, or a quarter of a mile in length, are poised in line, reaching towards each other, and connected at their extremities by ordinary girders 350 feet long, by which the two main spans are completed. The bridge consists of two main spans of 1700 feet, or nearly one-third of a mile each; two of 675 feet each, being the shore-ends of the outer cantilevers; and 15 spans of 168 feet each. The total length of the viaduct, including piers, is 8296 feet, or a little over $1\frac{1}{2}$ miles, of which almost exactly 1 mile is covered by the great cantilevers. The clear headway under the centre of the bridge is 152 feet at high-water, and the highest part of the bridge is 361 feet above the same level. Each of the three main piers consists of a group of four

cylindrical columns of masonry 36 feet high, each 49 feet in diameter at the top, and 55 feet at the bottom, founded on rock or on boulder-clay. To make assurance doubly sure, the superstructure is bolted down to each column with forty-eight steel bolts $2\frac{1}{2}$ inches in diameter and 24 feet long.

The piers were founded by means of Cofferdams

(q.v.) for shallow depths under water, and Caissons (q.v.) worked with compressed air for the deep water at Inchgarvie and at Queensferry. At Inchgarvie, two caissons constructed of wrought-iron plates, 70 feet in diameter, were sunk, the rock being excavated from below the lower edge of the cylinder, to a depth of 72 feet below the waves of the Forth. The operations were conducted under the pressure of compressed air in a mining-chamber 7 feet high, lighted by electricity, at the lower end of the caisson. A striking incident served to impress the reality of the high pressure of the air in this chamber. A flat-sided spirit-flask was taken down and emptied. The bottle of course was filled with compressed air, of a pressure of 33 lb. per square inch, and was corked. Under this pressure it exploded when passing through the Air-lock (q.v.) into the open air. At Queensferry, four caissons like those employed at Inchgarvie were sunk to depths of from 71 to 89 feet below high-water. The bed of the river was of soft mud, through which the caissons were sunk into hard boulder-clay. The mud, after having been diluted with water, was blown out by the compressed air supplied to the mining-chamber. The caissons were gradually filled with concrete as it was required, to steady them, and at the same time to drive them down by deadweight through the clay. When they were sunk to the required depth, the bottom or mining-chamber was cleared out and rammed with concrete, grouted up under pressure. No subsidence took place after this final operation, the boulder-clay being very hard. But independently of this consideration, it is readily seen that by in this way substituting the whole area of the immense circular caisson for the mere circular cutting-edge at the bottom to take a bearing on the clay, the bearing surface, and with that the resistance to a vertical load, was almost indefinitely increased. When the concrete was filled to the water-level, the piers were carried up with massive stones laid in cement, the whole pier becoming one solid mass.

The bridge is taper in plan, each span narrowing from a width of 120 feet—the distance apart of the lower members of each cantilever—at the pier, to a minimum of 31½ feet at the extremities of the cantilever, giving an outline, in a vertical view of it, like a truncated triangle, in order to confer a degree of stiffness laterally, for resisting irregular stresses, wind-pressure in particular. The metal columns above each pier, forming the basis of the cantilever, are 12 feet in diameter. The members under compression are tubular, those in tension are of open braced forms. The wind-pressure is assumed from calculation at a maximum of 56 lb. per square foot. The maximum possible stress on any member of the bridge is calculated to be at the rate of 7½ tons per square inch of sectional area, leaving a plentiful margin of strength, since the steel of which the bridge is constructed is capable of resisting a tensile stress of from 30 to 33 tons per square inch, and compression to the extent of from 34 to 37 tons per square inch. Between the two main girders a double line of railway is carried on an internal viaduct supported by trestles and cross girders. The whole of the metal-work of the superstructure is of Siemens steel. The way will consist of heavy bridge-rails laid on longitudinal sleepers bedded in four steel troughs, into which the wheels will drop in case of derailment, when they will run on the sleepers.

In the piers there are about 120,000 cubic yards of masonry, and in the superstructure 44,500 tons of steel. The bent steel plates which go to make the tubes and struts would, if placed in a line, end to end, stretch a distance of 42 miles. There are 20 acres of surface to be painted. The contract was let for the sum of £1,600,000, or £215 per lineal foot. An impression of the great magnitude of the bridge is derived from a comparison with the largest completed railway bridge in England—the Britannia Bridge, which has spans of 460 feet—little more than one-fourth of the spans of the Forth Bridge. The best proof of approval is imitation. In this connection mention should be made of the fine organisation of labour secured by Sir Wm. Arrol, of Tancred, Arrol, & Co., the contractors, and of the ingenious special tools designed by him for carrying out the work of construction. Since the first publication of the design for the Forth Bridge, nearly every new long-span bridge throughout the world has been built on the principle of that design, the most important being the railway bridge over the river St Lawrence at Quebec.

Quebec Bridge over the St Lawrence.—The Quebec Bridge and Railway Company called for tenders for this great structure in 1898, and the contract was eventually given to the Phoenix Bridge Company of U.S.A. The bridge, which connected

important railway systems and reduced the railway mileage between Moncton and Winnipeg by 219 miles, was of the cantilever type, and was designed for two lines of railway and a roadway and electric railway on each side, the length between abutments being 3240 feet. The great central span was 1800 feet (exceeding that of the Forth Bridge by 91 feet), and the central girder was 675 feet as compared with 350 feet in the Forth Bridge. The work of erection was started in July 1905, but unfortunately, on 29th August 1907, the structure collapsed while under construction, the disaster involving a serious loss of life. Immediately after this disaster the Canadian government appointed a royal commission to report upon it, and after receiving the report of this commission, a board of three engineers was appointed to prepare a new design for the bridge. Eventually, after much discussion, tenders were called for in June 1910, and the design of the St Lawrence Bridge Company was accepted in February 1911, and the contract was signed on 4th April 1911, the enterprise becoming thus a pure Canadian one. The new design provided for a total length of 3240 feet between abutments, a central span of 1800 feet, a central girder of 640 feet with a clear headway of 150 feet for this length; the total height of the two piers at the ends of the main span was 310 feet above the masonry-work. In the new design roadways were not provided, owing to the difficulties of making the necessary connections on the north side with existing highways, and to the greatly enhanced cost of superstructure if provision were made for them. The bridge as now constructed therefore carries only a double railway track and two side-walks, the width from centre to centre of trusses being 88 feet and uniform from end to end of the bridge. The work of erection proceeded smoothly up to September 1916. By this time the cantilevers had been completed and the 640 feet central span had been erected on false work at Sillery Cove on the north bank of the river, and the preparations for floating the span out and hoisting it into position had been made. On 11th September the girder was floated to its designed position and the work of lifting it began. Unfortunately disaster again overtook the bridge; when the girder was hanging about 30 feet above the level of the water it slipped off its supports and fell into the water at 10.46 A.M. Undismayed by this second failure, it was at once decided to rebuild the central span on exactly the same lines as that of the one which had fallen, and to adopt the same method of hoisting, employing new hoisting chains and rebuilding all the suspension gear and jacking girders. On 20th May 1917 work was



Fig. 16.—Quebec Bridge.

begun on the new central girder at the old site, Sillery Cove, and by 20th July the span was completed; on 17th September 1917 the girder, weighing about 5000 tons, was successfully towed out into mid-river, and by 9.10 A.M. the work of jacking was started; the work proceeded satisfactorily and without a hitch until 20th September, when the great girder had been lifted 150 feet to its final position, and on the 21st the permanent

connections to the cantilevers were all completed. The floor system was then laid across the span, and the first train crossed the bridge on 17th October, and on 3d December 1917 the great structure, with the greatest length of span ever constructed, was handed over to the Canadian government and opened for general traffic (fig. 16). (See *Transactions of the Engineering Institute of Canada*, 1919, vol. xxxii.)

The bridge over the Zambesi at the Victoria Falls (1905) is of great railway bridges the highest above water. Other railway bridges are:

	Length. Feet.	Greatest Span. Feet.
Forth Bridge.....	8296	1700
Brooklyn Bridge.....	5989	1595
Niagara Bridge.....	..	821
Britannia Bridge.....	1510	460
Victoria, Montreal.....	9144	330
Boyne Viaduct.....	1760	264
Tay Bridge.....	10,780	245
Charing Cross Bridge.....	1365	164
Crumlin Viaduct, Monmouthshire.....	1800	150
High-level Bridge, Newcastle-on-Tyne.....	1380	125
Amu-Daria Bridge.....	6320	..
Memphis Bridge (over Mississippi).....	1886	790
Cernavoda Bridge (Danube).....	2350	600
Sukkur Bridge (Indus).....	1250	790

The latter has cantilevers each 320 feet long.

Suspension Bridges.—These are bridges in which the roadway is suspended from chains, links, or ropes, passing over piers or towers, and fixed or anchored at their extremities. Another line of evolution had its origin in the principle of suspension. The simplest form, if possible, is a rope, traversed by a pulley, ring, or grooved block of wood, from which a rude car is suspended, or, in some cases, only a loop, in which the passenger sits, and either works himself across with his own hands, or is drawn from side to side by a smaller line attached to the car. Such elementary bridges have been in use from the earliest ages. More than a hundred and thirty years ago, Don Antonio de Ulloa described them as commonly used in the mountainous districts of South America. Structures of a more bridge-like character were erected by the Peruvians. Six strong cables are suspended across the river, four of which carry the platform, consisting of sticks laid across them, and branches of trees laid longitudinally upon the sticks. The two other ropes are considerably higher than the platform, and are connected with it. They serve as rails for the security of the passenger. Ulloa observes that 'the appearance of the bridges, which move with the wind, and are agitated by the movements of every passenger that crosses them, is very frightful at first.' They cross chasms hundreds of feet deep, through which cataracts of water, derived from the melting snow, rush, lashed into irresistible fury.

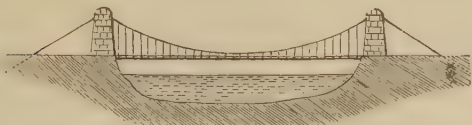


Fig. 17.—Suspension Bridge.

Fig. 17 is a typical illustration of a modern suspension bridge. When the weight of the roadway is known by the stress on the suspending links, the problem of statical equilibrium assumes the simplest form, and the conditions of strength and stability are readily determined. But when there is a shifting or rolling load on the roadway, which is heavy in proportion to the weight of the bridge, as, for example, a railway train, the conditions are involved. When the train occupies, say, only one-half of the bridge, the chain is depressed on that side, and is raised on the other side. Thus an undulation is produced in the bridge, which, especially if the train be moving rapidly, may seriously disturb the equilibrium, and even endanger the stability of the bridge. Various combinations have been devised to overcome this difficulty. The simplest and probably the best course is to stiffen the roadway, so that the stress of the passing load may be distributed over a considerable

length of the chain. In this manner large railway bridges have been constructed in America—for example, the Roebling's bridge (1855) over the Niagara, $2\frac{1}{2}$ miles below the falls, having a span of 822 feet, and being 245 feet above the level of the stream. A hundred yards higher up is a new cantilever railway bridge (1883).

The Menai Suspension Bridge, designed and constructed by Thomas Telford, was as great a step, in its own time, as its neighbour the tubular railway bridge of Robert Stephenson. After various abortive designs were proposed and abandoned, Telford put forward his plan for crossing the straits by a suspension bridge of one large span, 100 feet high above the water-level. The roadway is suspended from four cables, each consisting of four tiers of bars, making in all sixteen chains, having a drop of 57 feet, or about one-tenth of the span. There are two carriage-ways, each 12 feet wide, with a footpath between them, 4 feet wide. The chains consist of flat bars on edge, 10 feet long, 1 inch thick, and $3\frac{1}{2}$ inches wide, connected to each other by round bolts. The total length of the bridge is 1710 feet, or about one-third of a mile; and the distance between the points of suspension is 579 feet. The total weight of iron used for the structure was 2187 tons. The bridge occupied six years in construction, and was opened in 1825. The total cost, including the embankment and about half a mile of new line of road, was £120,000.

The success of the Menai Suspension Bridge having been assured, one of a still larger span, 870 feet, at an elevation of 167 feet above the river, was constructed at Freiburg, which crosses the valley of the Sarine, in Switzerland. The bridge was suspended by wire-ropes, each consisting of eighty wires, $\frac{1}{2}$ inch thick, tied together by coils at intervals. The bridge was finished in 1834. There is a similar, but rather smaller, bridge over the Gotteron, a tributary of the Sarine.

The Clifton Suspension Bridge (fig. 18) has an interesting record. In 1753 William Vick, a Bristol alderman, bequeathed the sum of £1000, to accumulate at compound interest until it reached £10,000, and then to be used in constructing a stone bridge at or near the site of the present Clifton Bridge. This sum was augmented by contributions, and in 1830 an act was obtained for the construction of the bridge, to the design of Mr Telford, having a central span of 400 feet. The work subsequently passed into the hands of Mr I. K. Brunel, a man of large ideas, who made a new design for a single span of 702 feet, at a height of 250 feet above high-water level. The new design was proceeded with in 1836, and the abutments and piers were completed; but, for want of funds, the work was arrested until 1860, when advantage was taken of the removal of the old Hungerford Suspension Bridge, to make room for the Charing Cross Railway Bridge. The chains were bought at a low cost, and in 1861 the works of the Clifton Bridge were resumed, in which the old chains were utilised. In the new bridge there are three chains on each side, supporting longitudinal stiffening girders of wrought-iron, with open-work cross-girders to carry the floor of the bridge. The hand-railing was also ingeniously utilised with lattice-work as a girder to co-operate in stiffening the platform. The span of the bridge, measured between the centres of the piers or towers, is $702\frac{1}{2}$ feet; the width is 31 feet, including 20 feet of roadway defined by the distance apart of the chains, and two footways, one at each side. The roadway is not on a dead level, but between the piers has a rise or arching of 2 feet. The chains, passed over the piers on cast-iron saddles or rollers, are carried downwards to land-saddles at a distance of 196 feet from the piers, bedded on

brickwork set upon the solid rock. Sixty feet farther the chains are carried down at an angle of 45 degrees to the anchorage-plates, bedded in a mass of brickwork in the form of an arch abutting on the solid rock far below the surface of the ground. All the links were proved with a stress of 10 tons per square inch. The platform is suspended by vertical rods from the chains, and that the stress on the rods may be adjusted and equalised, they are fitted each with a double adjusting screw at the lower end. The roadway is of creosoted timber 5 inches in thickness. The footways are laid with timber of half this thickness. The weight of the chains between the piers is 554 tons; and yet they are subject to a tensional stress of 680 tons at the middle, by their own weight. The suspension-rods, girders, flooring, &c. weigh 440 tons, making, with the chains, a total weight of nearly 1000 tons. It is calculated that, if the bridge be loaded all over the platform at the rate of 70 lb. per square foot, which is estimated as the maximum weight of a crowd, the final stress on the chains at the middle would amount to 2094 tons, or $4\frac{1}{2}$ tons on each square inch of section of the chains. In order to provide for the effects of expansion and contraction and other causes of disturbance, the two ends of the roadway are furnished with hinged flaps 8 feet long, which give perfect freedom of movement vertically as well as horizontally.

The Brooklyn Suspension Bridge across the East River, between New York and Brooklyn, opened in 1883, is built of steel. It has a central span of 1595½ feet, and two land spans of 930 feet each; making, with the approaches, a total length of 5989 feet, or about one mile and one furlong. The anchorage at each end is a solid cubical structure of stone, measuring 119 feet one way, by 132 feet the other, rising to a height of 90 feet above high-water mark, weighing 60,000 tons each. The towers are 276 feet high. The weight of the whole structure suspended between the towers is nearly 7000 tons. The stress of suspension is borne by four cables, of 5000 steel wires each, 15½ inches in diameter. The foundations of the towers were laid by means of caissons and compressed air, at a level of about 80 feet below high-water mark. The roadway presents five parallel avenues, of an average width of 16 feet each, the two outmost for vehicles, the central one for foot-passengers, and the other two for tramways. For the second bridge,

the longest suspension bridge in the world, see NEW YORK.

Movable Bridges.—Movable bridges are usually required in the neighbourhood of rivers, docks, wharves, canals, and like situations, for the passage of ships and boats. They are variously designed

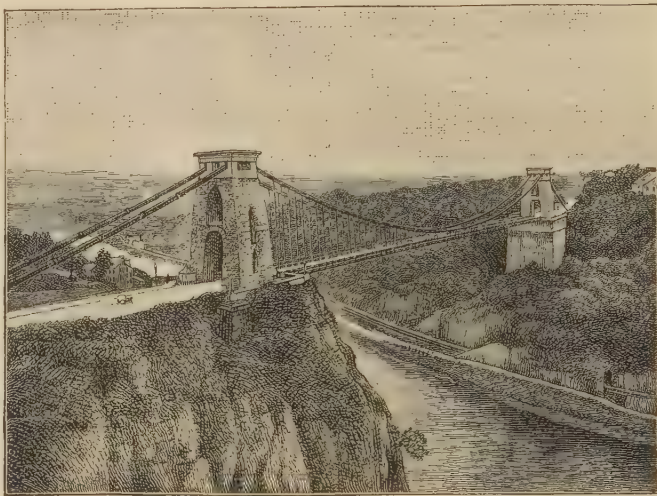


Fig. 18.—Clifton Suspension Bridge.

and adapted to particular situations, and may be classified as: (1) bascules or drawbridges, (2) swing bridges, (3) traversing bridges, (4) lift bridges, (5) pontoon bridges.

Bascules or Drawbridges.—The bascule bridge is such as is raised by turning, in one piece or in two pieces, round one or two horizontal axes or hinges. The most ancient form of the bascule was that of

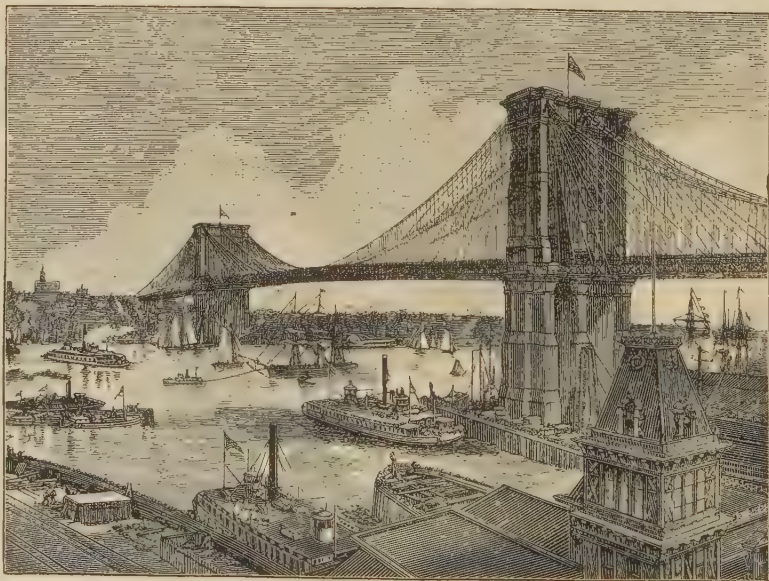


Fig. 19.—Brooklyn Suspension Bridge.

one flap of framed timber used to cross the moat or ditch of a fortress or castle, and capable of being drawn up by means of chains from the inside. For large dimensions it is convenient to construct the bridge in two halves, lifting from each side, and

abutting together at the middle. An excellent bascule bridge, erected in 1839, on the North-Eastern Railway, across the river Ouse, gives a clear waterway of 45 feet. The bridge is opened by two men, one at each leaf, in about one minute and a half, and is opened about eight times every day. One of the largest bascule bridges is that at Copenhagen, which was opened for traffic in 1867, giving a free passage-way of 56 feet 8 inches. The bridge is counter-weighted with 57 tons load at the end of the tail, which is $13\frac{1}{2}$ feet from the centre of the hinge.

The Tower Bridge, a bascule bridge, across the Thames, at the Tower of London, opened in 1894, is constructed on such a scale as to be the largest bridge in the world of the bascule class. It is illustrated by fig. 20. The bridge may be



Fig. 20.—The Tower Bridge.

described as a compound suspension and bascule bridge of three spans, of which the centre opening is fitted with a bascule or drawbridge, shown lifted in the figure. The bascule is carried by two massive Gothic towers, from which the chains or links are suspended, and in which provision is made for the machinery required for opening and closing the middle span. Lifts at both sides, as well as internal staircases, are provided for the use of foot-passengers. The lifts communicate immediately with the upper footway connecting the towers, so that the foot-traffic is never interrupted. The leaves of the drawbridge, when open, will be flush with the towers, allowing the largest shipping to pass through. When the bridge is closed, there will be sufficient height at high-water for the ordinary traffic of the river to pass under. The bridge has been built of gray granite for the lower portions, hard red brick for the upper portions of the towers. The opening of a passage for vessels, and the closing of the bridge, may be accomplished in the course of four or five minutes. Of the three spans, the clear centre opening for shipping is 200 feet, the side spans are each 270 feet, and the total length between abutments is 800 feet. The headway of the centre span when closed is $29\frac{1}{2}$ feet above Thames high-water, and that of the side spans is 27 feet. The height of the foot-bridge across the centre span is 135 feet above high-water. The approach-roads and the foot-bridge are 60 feet wide. The parliamentary estimate cost of the bridge, including land, is £750,000, or about £940 per lineal foot. The late Sir Horace Jones was

the architect, and Sir John Wolfe Wolfe-Barry is the engineer.

Swing Bridges.—Swing bridges are by far the most commonly employed of movable bridges. The large rivers to be crossed in America have demanded swing bridges of great span, with excellent contrivances for minimising friction and insuring steadiness when closed. The swing bridge over the Raritan, in New Jersey, U.S., allows two free passages, each 216 feet wide. It is what is known as a double-swing bridge—the bridge being balanced on a central pivot assisted by a system of rollers—opening and closing two passages at once, and affording two passages instead of only one, as in the earlier bridges, which were generally made in two leaves to cross single passages. The Kansas City Bridge crosses

two passages, each 160 feet wide. The total moving weight is 303 tons. The bridge is opened by steam-power in about one minute and a half, or by manual power in two minutes. From two-thirds to three-fourths of the moving weight rests on the central pivot.

Traversing Bridges.

—Movable bridges, sometimes called telescope bridges, capable of being rolled horizontally backward, or in an oblique direction, are occasionally employed. The bridge across the Arun, near Arundel, on the South Coast Railway, is 144 feet long. It is traversed on wheels, and acts as a sliding cantilever, the over-

hanging portion resting on the opposite abutment when in place.

Lift Bridges.—These are not common. There appear to be only two—one erected over the Surrey Canal, which is lifted by the four corners; and another over the Royal Canal, Dublin. In the second case, a branch railway crosses the canal at an angle of 25 degrees. The bridge first made for the situation weighed 14 tons, and was balanced by a counterpoise consisting of a tank filled with water, the counterpoise, empty, being 1 ton lighter than the bridge, and when loaded with 2 tons of water, 1 ton heavier. The bridge could thus be raised and lowered with the aid of a man at a winch. The lift of the bridge was $7\frac{1}{2}$ feet, which gave a headway for barges equal to that of the adjoining stone bridge. The supply of water for working the bridge was taken from an adjacent lock. At the four corners rams worked into cylinders, which admitted water from the lock to enter through small holes, and fill the cylinders as the rams were drawn up in the raising of the bridge, acting as a check in case of accident. The bridge has been reconstructed for a greater lift.

Pontoon or Floating Bridges—Bridges of Boats.

—Bridges of boats are made of boats laid over with planks, fastened across the stream by means of anchors or stakes. The bridge at Rouen is 300 yards long, paved with stone for the passage of carriages and horses. The so-called 'flying bridge' is rather a ferry than a bridge of boats (see FERRY).

A well-known pontoon bridge was designed by Mr Mallet to cross the Royal Canal at the Broad-

stone terminus of the Midland Great Western Railway of Ireland. The general idea is that of a pontoon or flat-bottomed boat of iron. When the bridge is in place, water is admitted until it settles down firmly on timber wall-plates. To open it the water is drawn off by a movable siphon, which is connected with a fixed pipe, having a considerable vertical fall. A smaller branch pipe is set at an angle to the exhaust-pipe, and through it a strong jet of water is allowed to issue. This operation, on a well-known principle of hydrodynamics, sucks away the air from the siphon and causes it to act. The bridge then floats, and is drawn into a recess, leaving the passage clear along the canal.

The longest floating bridge in the world, probably, is the pontoon bridge across the river Hugli, at Calcutta, designed and constructed by Sir Bradford Leslie. The bridge is 1530 feet long between the abutments, and is carried on 14 pairs of pontoons, which are held in position by means of chain-cables, $1\frac{1}{2}$ inches thick, and anchors weighing 3 tons each, laid on the up-stream and down-stream sides, 900 feet asunder. By their great length, the cables afford the necessary spring to allow for the ordinary rise and fall of the river, the stress on each cable varying from 5 tons to 25 tons, according to the state of the weather and of the tide, the maximum velocity of which is 6 miles an hour. The pontoons are rectangular iron boxes, having rounded bilges and wedge-shaped ends. They are each of the great length of 160 feet, made of such considerable length in order to obviate pitching motion in rough weather, with a beam of 10 feet, and depth of from 8 to 11 feet, presenting a side of from $3\frac{1}{2}$ to 4 feet above water, according to the state of the traffic. For perfect safety, each pontoon is divided by bulkheads into 11 compartments. They are made of iron plates $\frac{1}{2}$ inch and $\frac{3}{8}$ inch in thickness, riveted together. The platform of the bridge is supported by tressel-work on the pontoons at a clear height of 27 feet above the water—a convenient height for boat navigation. The roadway platform is of 3-inch planks of teak-wood from Burma, forming a roadway 48 feet wide, with a footpath at each side, 7 feet wide. An opening 200 feet wide, for the passage of ships, is made by removing, when occasion requires, four of the pontoons with their superstructure, and sheering them clear of the opening. The portion so removed is in two divisions, which are separately secured, right and left, and when in place, are connected by draw-bridges with the fixed portions of the bridge. Before launching, the pontoons were ballasted sufficiently to make them float upright; and were afterwards coupled in pairs by the cills of the main trusses, when the ballast was removed. The floating bridge is connected with the shore at each end by adjusting ways hinged to the shore. The ordinary time taken to open the bridge is 15 minutes; and to close it, 20 minutes. It is only opened twice a week. The bridge cost £182,000, or about £120 per lineal foot.

MILITARY BRIDGES are temporary constructions to facilitate the passage of rivers by troops, to restore a broken arch, or cross a chasm of no very great width. Those over a river are either floating or fixed. The former are made of Pontoons (q.v.), boats, casks, rafts of timber, or anything that will give sufficient buoyancy, and the latter of piles, tressels, or other timber work. Spars, ropes, and planks are used in a variety of ways for spanning narrow chasms. The pontoon bridge is the only one which is carried with an army. Enough material for 100 yards of length accompanies each army corps. All military bridges have their roadway formed in the following manner: five to nine road-bearers of stout timber support chasses or flat planks 10 feet long, held in position so as to

form a level surface, by two ribands placed above them and over the outer road-bearers, to which they are fastened by rack-lashings. The road-bearers are supported by the pontoons, casks, boats,

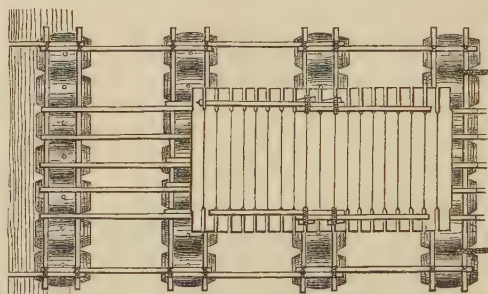


Fig. 21.—Military Bridge.

tressels, or piles, which form the piers, usually 10 to 15 feet apart, or by transoms on the ropes in the case of suspension bridges. To prevent injury to the boats, barks of timber are built up along the keel of each for the road-bearers to rest upon. A saddle on pontoons and gunnels on casks answer the same purpose, and in the latter case keep the casks together by being lashed to them. The maximum loads such bridges are usually calculated to bear are, for infantry, 5 cwt. per lineal foot; for cavalry, 2 cwt.; for field artillery, with two horses per gun only, $4\frac{1}{2}$ cwt. Heavy guns are better warped across on specially constructed rafts. A flying bridge is a boat or raft anchored by a long cable up-stream, and carried across by the action of the current acting obliquely against its side, which should be kept at about an angle of 55 degrees with the current.

Of the rock formations called *Natural Bridges*, the most remarkable is the natural bridge over Cedar Creek, in Virginia, U.S., 125 miles W. of Richmond. The mass of siliceous limestone through which the little river passes is presumably all that remains of a once extensive stratum. The cavern or arch is 200 feet high and 60 feet wide. The solid rock walls are nearly perpendicular, and the crown of the arch is 40 feet thick.

See Edwin Clark, *The Britannia and Conway Tubular Bridges* (1850); James Hodges, *Construction of the Great Victoria Bridge in Canada* (1860); Samuel Smiles, *Lives of the Engineers* (1862-68); J. Gwilt, *An Encyclopedia of Architecture* (1867); J. A. L. Waddell, *Iron Highway Bridges* (1884); C. B. Bender, *Design of Metallic Bridges* (1885); Henry Law and D. K. Clark, *Civil Engineering* (1881); J. Claxton Fidler, *A Practical Treatise on Bridge Construction* (1887); W. Westhofen, *The Forth Bridge*; and the *Minutes of Proceedings of the Institution of Civil Engineers*.

Bridge, in musical instruments, transfers the vibrations of the strings to the resonance box, and is of the utmost importance in the violin and its kindred, as its material, shape, and position affect the tone. One foot acts chiefly upon the belly of the violin; the other, through the medium of the sound-post immediately below it, upon the back. The bridge raises the strings above the belly so that they may be acted on by the bow, and likewise determines the end of the vibrating portion. It assumed its present form in the time of the Amatis.

Bridge, SIR JOHN FREDERICK, organist, composer, conductor, and writer on music, was born at Oldbury, Worcestershire, 5th December 1844. He was organist of Manchester Cathedral 1869-75, deputy organist of Westminster Abbey 1875-82, organist 1882-1918, professor in London University from 1902, and held other offices. He composed oratorios and cantatas, and organ music; wrote

Samuel Pepys, Lover of Musique (1903), *A Westminster Pilgrim* (reminiscences, 1919), *Twelve Good Musicians* (1920), *The Old Cryes of London* (1921).—His brother, JOSEPH COX BRIDGE, composer, organist, professor of music at Durham, was born at Rochester in 1853.

Bridge, WHEATSTONE'S, a device for comparing electrical resistances, not invented by Wheatstone (q.v.). See ELECTRICITY, and fig. 17 there.

Bridge-head, or TÊTE DE PONT, is an arrangement of defensive works on the far bank of a river, which runs at right angles to the line of advance of an army. It consists of a central work immediately covering the bridge or bridges, and a line of detached redoubts on a wide arc.

Brیدنorth. See BRIDGNORTH.

Bridge of Allan, a police burgh of Stirling-shire, on Allan Water, 3 miles N. of Stirling, has saline wells and a mild climate, and attracts many visitors. Between it and Stirling is the Abbey Craig, with its Wallace Monument, commanding a fine panorama. Pop. 3500.

Bridgeport, a city and port of Connecticut, at the mouth of the Pequannock, which empties itself into an inlet of Long Island Sound, 57 miles NE. of New York. It has a safe harbour for small vessels, and a considerable coasting-trade. The city is modern and well built, and the streets are shaded by trees; Golden Hill, commanding fine views of the sound and shore, is covered with good residences, many of the inhabitants belonging to New York. There are manufactures of machinery, war-stores, &c. Pop. (1870) 18,869; (1890) 48,866; (1910) 102,054; (1920) 143,555.

Bridges, ROBERT SEYMOUR, poet-laureate since 1913, was born 22d October 1844 the son of a Kentish squire, studied at Eton and Corpus Christi, Oxford, qualified in medicine at Bartholomew's, and practised in that and other London hospitals till he retired in 1882. For a dozen years before that he had been known as a cultured and scholarly poet of indisputable and unique gifts; his lyrics give him a place apart from contemporaries, and some of them have a charm hardly equalled since the Elizabethan days. *The Growth of Love*, *Prometheus the Fire-giver* (1883), *Eros and Psyche* (1885), *October* (1920), are noteworthy poems and volumes; and his plays include *Nero* (1885), *Achilles in Scyros* (1890), *Palicio*, *Ulysses*, *The Christian Captives*, *The Humours of the Court*, *The Feast of Bacchus* (1889), *Demeter* (1905). He showed rare sympathy and insight as a critic in his essay on Keats; and by his examination of Milton's prosody and other studies on verse forms, he has shed much light on the mysteries and fascinations of the subtlest metrical rhythms and harmonies. He has been, perhaps, less happy in his tracts on pronunciation and in his experiments in classical metres, such as *Ibant Obscuri* (1916). Sometimes he seems to defy his own lessons; at times his verses are apparently written to illustrate his theories; and some of his experiments—such as the 'Peace Ode' in 1903, written so that 'if English were spelt as it is or should be pronounced, the syllables would scan according to the laws of Greek prosody'—must be pronounced scholarly, ingenious, and original rather than inspired, happy, or melodious.

Bridget, St (*Birgitta* or *Brigitta*), was born at Finstad, in the district of Uppland, in Sweden, in 1302 or 1303, her parents being of the blood-royal of Sweden. At fourteen she married Ulf Gudmarson, by whom she had eight children. She was for some years mistress of the royal household, and afterwards made pilgrimages to the shrines of St Olaf at Trondhjem, and of Santiago de Compostela in Spain. Ulf died in 1344, and Bridget

founded about the same time the monastery of Wadstena, in East Gothland. Sixty nuns and seventeen monks, with eight lay-brothers, received the rule of St Augustine, as modified by St Bridget, and constituted a new order, which at one time had seventy-four establishments scattered throughout Europe, from Finland to Spain; it has now only a few representatives in Spain, Bavaria, and Belgium. In 1349 St Bridget went to Rome, and, having made a pilgrimage to Palestine, died at Rome on her return in 1373. She was canonised in 1391 by Pope Boniface IX. Her daughter, St Catharine of Sweden (1335–81), was canonised in 1489. The *Revelationes Sanctæ Brigittæ* were written by her confessors; to Bridget have been attributed some discourses on the Virgin and the passion of Christ.

Not to be confounded with this Swedish saint is the Irish St Brigit, or Bride of Kildare (453–523). It is tolerably certain that she was the daughter of one Dubtach at Fochart Muirthemne, in Leinster, entered a monastery at Meath in her fourteenth year, through her extraordinary piety and beneficence gained great fame and influence, and founded four monasteries, the first and chief of these at Kildare, where, after her death, she was buried, and a perpetual fire was kept up in her memory. The rest of her traditional history is a mass of astonishing miracles, and it is supposed that many of these, along with the sacred fire (which was abolished by the bishop of the diocese in 1220), were transferred to St Brigit from the heathen goddess Ceridwen, the Celtic Ceres, on the ruins of whose chief sanctuary the monastery at Kildare was built. She was regarded as one of the three great saints of Ireland, the others being St Patrick and St Columba; in Scotland, too, she was held in reverence, and by the Douglasses was regarded as tutelary saint.

Bridgeton, a city and port of entry in New Jersey, U.S., on both sides of Cohansey Creek, navigable up to this point, 38 miles S. of Philadelphia. The town contains the West Jersey Academy and other educational institutions, and a public library. It has glass-works, iron-works, and manufactures of woollen goods, leather, carriages, machinery, and canned fruits. The surrounding region is well cultivated and fertile. Pop. (1870) 6820; (1880) 8729; (1890) 11,424; (1920) 14,323.

Bridgetown, the capital of Barbados (q.v.), is situated on the west coast of the island along the north side of Carlisle Bay, which forms its roadstead. The inner harbour is protected by a breakwater known as the Mole Head. Founded in 1628, the town took the name Indian Bridge, and later its present appellation, from a rude aboriginal structure which spanned a neighbouring creek. The town was almost destroyed by fire in 1666, and again in 1766. In 1831 a part of Bridgetown was destroyed by a hurricane, and in 1845 it again suffered severely from fire. It is the residence of the Bishop of Barbados, and has a college, several high-class schools, town-hall, government buildings, hospital, water-works, and jail. To the south are the barracks, with parade-ground and arsenal. A short railway was completed in 1882. Pop. about 17,000.

Bridgewater. See BRIDGNORTH.

Bridgewater, FRANCIS EGERTON, third DUKE OF, the 'father of British inland navigation,' was born in 1736, and succeeded his elder brother as duke in 1748. In 1762–72 he constructed, after the plans of the celebrated Brindley, the earliest canal in England, 42 miles long, uniting Worsley with Manchester and Runcorn on the Mersey above Liverpool. The canal crossed the

Irwell by an aqueduct 39 feet high and 600 feet long. The duke exhausted his credit to the utmost on his undertaking, nobly restricting himself to the simplest fare for the sake of his idea, but his far-sightedness was equal to his public spirit, and great wealth ultimately flowed in upon him. The success of this canal gave an impulse to the internal navigation of England, and led to the extension of the canal-system throughout the kingdom. In 1873 the Bridgewater Canal was purchased from Lord Ellesmere for £989,612, including the plant, valued at £150,000; and in 1887 it was resold to the Manchester Ship Canal Company for £1,710,000. The duke took little part in politics, but belonged to Pitt's party. He died unmarried, March 8, 1803, and with his death the dukedom became extinct.

Bridgewater, FRANCIS HENRY EGERTON, EARL OF, son of John Egerton, Bishop of Durham, grandnephew of the first Duke of Bridgewater, was born 11th November 1758, and succeeded his brother as eighth earl, October 21, 1823. Educated for the church, he had previously been prebendary of Durham. He died unmarried, February 11, 1829, and the title became extinct. By his last will, dated February 25, 1825, he left £8000, invested in the public funds, to be paid to the author of the best treatise 'On the Power, Wisdom, and Goodness of God, as manifested in the Creation,' illustrating such work by such arguments as the variety and formation of God's creatures in the animal, vegetable, and mineral kingdoms, the effect of digestion, the construction of the hand of man, and by discoveries, ancient and modern, in arts, sciences, and the whole extent of literature. The then president of the Royal Society of London, Davies Gilbert, to whom the selection of the author was left, with the advice of the Archbishop of Canterbury, the Bishop of London, and a friend of the earl, resolved that the money should be allotted to eight different persons for eight separate treatises. The earl also left upwards of £12,000 to the British Museum, the interest to be employed in the purchase and care of MSS.

The BRIDGEWATER TREATISES are: (1) *The Adaptation of External Nature to the Moral and Intellectual Constitution of Man*, by Thomas Chalmers (1833); (2) *Chemistry, Meteorology, and Digestion*, by William Proutt, M.D. (1834); (3) *History, Habits, and Instincts of Animals*, by Kirby (1835); (4) *Geology and Mineralogy*, by Dean Buckland (1837); (5) *The Hand, as evincing Design*, by Sir Charles Bell (1837); (6) *The Adaptation of External Nature to the Physical Condition of Man*, by J. Kidd, M.D. (1837); (7) *Astronomy and General Physics*, by Whewell (1839); (8) *Animal and Vegetable Physiology*, by P. M. Roget, M.D. (1840). All these works were afterwards republished in Bohn's Scientific Library.

Bridgman, LAURA. This famous blind-mute was born in Hanover, New Hampshire, U.S., on the 21st December 1829. She was a bright, intelligent child, but at two years of age was seized with a violent fever, which utterly destroyed sight, hearing, and sense of smell, while her sense of taste was also impaired. For a time this so shattered her system that there seemed no hope of recovery; but she rallied, and soon learned to find her way about the house and neighbourhood, and even learned to sew and to knit a little. At the age of eight Dr Howe of Boston undertook her care and education at the Perkins Institution for the blind. The first attempt was to give her a knowledge of arbitrary signs, by which she could interchange thoughts with others. Then she learned to read embossed letters by the touch; next, embossed words were attached to different

articles, and she learned to associate each word with its corresponding object. Thus far, however, the work was only an exercise of imitation and memory; but at last the truth flashed upon her, that by this means she could communicate to others a sign of what was passing in her own mind. Her whole being seemed changed. The next step was to procure a set of metal types, with the letters cast at the ends, and a board with square holes for their insertion, so as to be read by the finger. In three months she could write down the name of most common objects, and in two years had made great bodily and mental improvement. She grew happier, and enjoyed play like other children, amusing herself with imaginary dialogues. Her touch grew in accuracy as its power increased; she learned to know people almost instantly by the touch alone. In a year or two more she was able to receive lessons in geography, algebra, and history; and learned to do needlework and various household duties. She received and answered letters from all parts of the world, and was always employed, and therefore always happy. She learned to write a fair, legible, square hand, and to read with great dexterity, and at last, even to think deeply on religious and other subjects, and to reason with good sense and discrimination. She afterwards became skilful as a teacher of the blind and deaf and dumb, and died 24th May 1889. Dickens gave some account of her in his *American Notes*; and see works on her by Miss Lamson (1878), and by the two daughters of Dr Howe (1904).

Bridgnorth (formerly *Brug* or *Bruges* = Bridge), a municipal borough of Shropshire, 19 miles S.E. of Shrewsbury. The Severn divides it into the upper or 'High Town,' and lower or 'Low Town.' The former is built on a red sandstone rock rising 180 feet above the right bank of the river. This rock was formerly crowned by a royal fortress, a huge leaning fragment being all that now remains of the keep. The walk round the castle-hill was said by Charles I. to be 'the fairest in his dominions.' Bridgnorth has two parish churches, a grammar-school existing in Henry VIII.'s reign, carpet, worsted, and tanning industries, and agricultural trade. Until 1868 it sent two members, and until 1885 one member, to parliament. The Danes wintered here in 896, and the site of a Saxon castle, built by the princess Ethelfleda, is still distinctly marked. Early in the 12th century, Robert de Belesme (a kinsman of the Conqueror) built the Norman castle, and unsuccessfully defended it against Henry I. It was also besieged by Henry II. and Edward II. According to Shakespeare (*Henry IV., Part I., III. iii.*), Bridgnorth was the meeting-place of the royal forces before the battle of Shrewsbury; and, according to Clarendon, before the battle of Edgehill. The castle was demolished by the Parliamentarians after a three-weeks' siege, during which the 'High Town' was destroyed by fire, one of the few houses surviving being the fine old Tudor mansion, still standing, in which Bishop Percy was afterwards born (1728). To recompense the inhabitants, Charles II., by proclamation, authorised them to make a special collection in every church throughout the kingdom. High Town and Low Town are connected by an inclined railway (1892). Pop. 5000.

Bridgwater, a municipal borough and seaport town of Somersetshire, on both sides of the Parret, 6 miles in a direct line, and 12 by the river, from the Bristol Channel, and 29 miles S.W. of Bristol. It stands on the border of a plain between the Mendip and Quantock Hills, in a well-wooded country. It is chiefly built of brick, and an iron bridge connects it with the suburb of Eastover. St Mary's Church has a remarkably graceful

spire, and contains a fine altar-piece. The Parret admits vessels of 700 tons up to the town; it rises 36 feet at spring-tides, and is subject to a bore or perpendicular advancing wave, 6 or 8 feet high, often causing much annoyance to shipping; a canal gives water communication with Taunton. Bath or scouring bricks, of which Bridgwater has a monopoly, are made here of a mixture of sand and clay found in the river, and there are carriage-works and potteries. Coal, grain, wine, hemp, tallow, and timber are imported; while bath-bricks, earthenware, cement, and agricultural produce are exported. The Conqueror granted the manor to one Walter de Douay, and its name thereupon became *Brigge-Walter*, of which *Bridgwater* is a mere corruption. A castle was built here in the reign of John, and an Augustinian abbey about 1230. Admiral Blake was a native of this town, which suffered severely in the civil wars, when besieged for a whole week by Fairfax, and forced to surrender, the castle being dismantled. The battle of Sedgemoor (q.v.) was fought in 1685 near Bridgwater, whose corporation had proclaimed the Duke of Monmouth as king. Bridgwater formerly returned two members to parliament, but was disfranchised in 1870. Pop. 16,000. See books on the history of the town by Jarman (1889) and A. H. Powell (1908).

Bridle and Bit, that part of a horse's harness which is attached to the head and mouth, by means of which he is governed and restrained. The proper hitting of horses has been a matter of much study in England, and innumerable kinds of bits have been introduced for the purpose. It will be sufficient for our purpose, however, to describe

only a few of those most generally used. The ordinary single riding-bridle, with a snaffle-bit, is shown in fig. 1. The driving-bridle is similar in principle, with, generally, the addition of *blinkers*—i.e. pieces of leather fastened to the cheek-pieces of the headstall to prevent the horse seeing in any direction except straight forward; the theory being that he would be startled by anything catching his eye from behind.



Fig. 1.

a, headstrap; b, front; c, cheek-piece; d, throat-band; e, nose-band; f, reins.

There are several forms of the snaffle-bit. The common riding form (fig. 2, a) is a round smooth bit, jointed in the middle, attached at either side to straight bars or cheeks, which prevent the bit being pulled through the horse's mouth, and with rings to which the reins and cheek-pieces of the headstall are fixed. The twisted snaffle has the mouthpiece twisted or fluted, increasing its severity on the horse's mouth. The ring snaffle is made without cheeks; and the rings for headstall and reins are not fixed, but work loose in holes at the ends of the mouthpiece. Another form which is very generally used, especially in driving, is the double-ring snaffle (fig. 2, b), having two rings at either end, one working within the other, to one of which the reins are fastened, and to the other the headstall. The snaffle being jointed, its action is to press on the sides or *bars* of the lower jaw, and not on the tongue, while its shape prevents anything like severity.

The double or Weymouth bridle is generally used in the hunting-field and often for ordinary purposes.

It has two separate bits, the snaffle and curb, or bridoon and bit, each having separate headstalls and reins. The snaffle or bridoon is like the plain ring snaffle already described. The bit or curb (fig. 2, c) has a fixed unjointed mouthpiece having

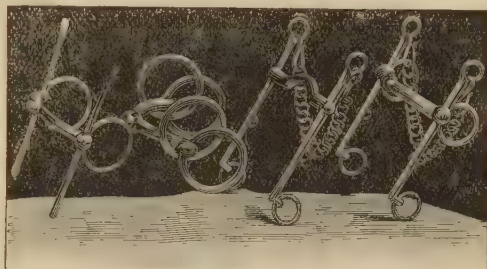


Fig. 2.

an upward curve, or *port*, of varying size, in the centre, which answers the same purpose as the joint in the snaffle of confining the pressure of the bit to the *bars*, where it is most effective. Hooks are fixed to the upper end of the cheeks, on which the curb-chain is hung, and which is passed round the chin-groove under the horse's under-jaw. To the lower end the curb-reins are attached; the other reins are fastened to the bridoon-rings. One advantage of the double bridle is that its action can be varied according as the curb or snaffle rein is tightened or relaxed. Military bridles are double, and generally similar to that just described, except that the cheeks are made in the form of the letter S, and other ornamentation added.

The Pelham is an extensively used modification of the double bridle. It consists of a single bit (fig. 2, d) similar in form to the curb-bit of the double bridle, but with the addition of rings fixed to the cheeks at either end of the mouthpiece to which reins are attached, in addition to those fixed to the lower end. The curb-chain is adjusted as in the double bridle. The running martingale is an arrangement applicable to any bridle, by which a pair of reins run through rings at the ends of two straps attached to the horse's girth to prevent him throwing his head up.

In connection with driving-bridles, two questions have in recent years caused considerable discussion—viz. *bearing-reins* and *blinkers*. The bearing-rein, in its simple form, is intended as a support to the horse's head, and consists of a strap buckled to the ring of the bridoon-bit of a double bridle, passed through a swivel on the throat-band, and fastened to a ring on the saddle-pad. In its severe form, known as the 'gag,' it is attached to the headpiece, passes through the bridoon-ring, through a swivel on the throat-band, and then to the saddle. The effect is to cramp the horse's neck, and prevent him throwing his nose forward, but it is supposed to improve his appearance in a carriage. The opponents of the bearing-rein complain of the torture unnecessarily inflicted on the horse, and hold that nature supplies all the support necessary for the head. The blinker question is not so important, and consists of a difference of opinion as to whether a horse would or would not be more easily startled with his eyes uncovered.

In European nations and in North America, the bridles used are generally similar to those described; but among the Arabs and in South America and some parts of Mexico and Texas, a heavy, old-fashioned, and terribly cruel curb-bit is used. On the other hand, the stockmen of the Australian bush employ the plain snaffle-bridle alone, with which they manage their powerful and usually half-broken horses easily, an equal tribute to the

sufficiency of the snaffle and their own horsemanship.

It is interesting to know that in the representations of harnessed horses in the Assyrian sculptures the bridle generally shown is apparently almost

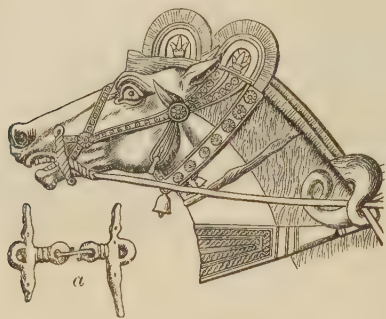


Fig. 3.

identical with the modern snaffle. Fig. 3 represents a chariot horse with bridle (Koyunjik); a, a bronze bit from Nimroud. See Major Dwyer's *Seats and Saddles, Bits and Bitting*; Stonehenge's *Horse in the Stable and Field*. See also HORSE, RIDING AND DRIVING.

Bridlington, or BURLINGTON, a town in the East Riding of Yorkshire, 6 miles SW. of Flamborough Head, and 23 SSE. of Scarborough. An old-fashioned place, with narrow irregular streets, and with a considerable trade in corn, it is supposed to have been the site of a Roman station. From 1664 till 1753 it gave title of Earl of Burlington in the peerage of England to the Boyle Earls of Cork. An Augustinian priory of immense wealth, founded in the reign of Henry I., is represented by the nave of its splendid church, which, mixed Early English and Perpendicular in style, was restored by Sir Gilbert Scott in 1857. On Bridlington Bay, a mile to the south-east, is Bridlington Quay, the port of the town, which has risen into repute as a watering-place, has fine sands, a parade, ornamental gardens, a chalybeate mineral spring, and hot and cold baths. The bay has good anchorage, and the harbour is inclosed by stone piers. In 1643 Henrietta, queen of Charles I., landed here from Holland with arms and ammunition bought with the crown-jewels, when Bridlington was cannonaded for giving her refuge. Bridlington is noted for its chalk-flint fossils. Hundreds of windbound vessels may sometimes be seen in Bridlington Bay, stretching north to Flamborough Head, which affords good shelter and anchorage. Pop. (municipal borough) 23,000.

Bridport, a municipal borough of Dorsetshire, at the confluence of the Asker and the Brit, 2 miles from the English Channel, and 16½ W. of Dorchester by rail. It stands on an eminence surrounded by hills, and consists chiefly of one spacious street running east and west, and of another stretching towards the sea. It has a town-hall (1785), and a good cruciform parish church (restored in 1865). Till 1867 Bridport returned two members to parliament; and till 1885, one. The chief manufactures are ropes and cordage (a 'Bridport dagger' was proverbial for a halter in Leland's day), besides twine, shoe-thread, fishing-nets, and sailcloth. Bridport was a considerable town before the Norman Conquest, and had a mint for coining silver. Vessels of 250 tons can enter the harbour, which is 1½ mile below the town; and there is some foreign and coasting trade, timber, coal, and flax being imported. Pop. 6000.

Brief, or BREVE, PAPAL (from Lat. *brevis*, 'short'). The word breve was originally used in

the Low Latin of the middle ages for ecclesiastical documents of various kinds—e.g. for inventories of church goods. It now signifies such papal documents as are issued without some of the solemnities proper to bulls, and which assumed a recognised name and form in the 15th century. They were introduced in order to lighten the work of the papal chancery. The brief is written on a sheet of thin white parchment, of greater breadth than height, in current Latin characters. It has a stamp of red wax bearing the impress of the fisherman's ring—i.e. a figure of St Peter hauling in his net, surmounted by the name of the pope. The name of the pope also appears on the first line of the brief, then follows 'Dilecte fili (or the like), salutem et apostolicam benedictionem,' 'In perpetuum,' &c., being sometimes added as in bulls. It ends with the words 'given at Rome at St Peter's under the ring of the fisherman,' followed by the day of the month (not as in bulls according to the old Roman, but according to the modern mode), the year of the Christian era and of the pontificate. It is subscribed by the secretary of briefs. A comparison with the article BULL will show the difference between the two kinds of documents, which has been considerably lessened by the legislation of Pope Leo XIII.

Brief, in the practice of the English bar, is the name given to the written instructions on which barristers advocate causes in courts of justice. It is called a brief because it is, or ought to be, an abbreviated statement of the pleadings, proofs, and affidavits at law, or of the bill, answer, and other proceedings in equity, with a concise narrative of the facts and merits of the plaintiff's case, or the defendant's defence. Probably, when pleadings were entirely oral, nothing was handed to counsel except the brief or writ originating the action. The brief is often called 'observations' in Chancery proceedings. In Scotland, the corresponding term is *Memorial*. *Breve* (q.v.) in Scotland has a different meaning. This paper should be confined to the statement of facts without argument or quotation. —*Kings' Briefs* were royal mandates ordering collections to be made in chapels for building churches, relieving sufferers by fire, refugees, and suffering Protestants abroad.

Brieg, a town of German Silesia, on the left bank of the Oder, 27 miles SE. of Breslau by rail. The 13th-century church of St Nicholas has a splendid organ and towers added in 1884-85. Brieg manufactures machinery, ironwares, thread, sugar, leather, tobacco, &c. Pop. 26,000.

Briel, or BRIELLE, sometimes THE BRILL, a fortified seaport town of south Holland, situated on the north side of the island of Voorne, near the mouth of the Maas. It contains a government arsenal and military magazines, and possesses a good harbour. The tower of St Peter's Church serves as a lighthouse. Pop. 4000, most of the men engaged as pilots and fishermen. Briel may be considered as the nucleus of the Dutch republic, having been taken from the Spaniards by William de la Marck in 1572 (see HOLLAND). Admiral Tromp was a native.

Brienne-le-Château, a small town in the French department of Aube, on the right bank of the river Aube, 35 miles ENE. of Troyes. At the military school here (suppressed in 1790) the great Napoleon spent five years. Here, too, he was defeated by the allies, after a desperate struggle, in the last days of January 1814. This victory opened the way to Paris, and led to the fall of the empire.

Brienzen, a Swiss town, beautifully situated at the foot of the Bernese Alps, on the north-east shore of the lake of the same name, 30 miles ESE.

of Bern; pop. 3000.—The pretty lake of Brienz, which is $8\frac{1}{2}$ miles long and $1\frac{1}{2}$ in breadth, is an expansion of the river Aar, and is believed to have been at one time united with Lake Thun. It lies 1857 feet above the sea, is 859 feet deep at one point, and is surrounded by lofty mountains, the principal of which is the Rothorn.

Brierley, BENJAMIN (1825-96), a Manchester weaver who read industriously in the English poets, and from 1855 onwards made a name for himself as a writer of Lancashire stories and verses, many of them in the Lancashire dialect.

Brierley Hill, a town of Staffordshire, $2\frac{1}{2}$ miles NE. of Stourbridge. The district abounds in coal, iron, and fireclay; there are collieries, iron-works, glass-works, brick-works, and potteries. Pop. 12,500.

Brieux, EUGÈNE (born in Paris in 1858), by his comedies and plays—of which *Maternity*, *The Three Daughters of M. Dupont*, and others have been translated—earned a seat in the Académie Française and a reputation as Augier's successor, a gifted dramatist and a powerful censor morum.

Brig, a square-rigged vessel with two masts. A brigantine, or hermaphrodite brig, has the mainmast of a schooner and the foremast of a brig.



Brig.

A brig's mainsail is the lowest square-sail on the mainmast, whereas the mainsail of a brigantine is a fore-and-aft sail like that of a schooner.

Brigade, in its proper military sense, is a tactical and administrative group of battalions or regiments or batteries, commanded by one superior officer (see BRIGADIER). In most modern armies an infantry brigade consists of two regiments, but in Britain it has four battalions, three of such brigades supplying the infantry of a division. In a cavalry brigade there are three regiments, four of such brigades in the British army forming, in war, a cavalry division. Only in recent years have these brigades been permanent units in peacetime. Brigade of Guards is the term applied to the regiments of Foot Guards. The regiments of Life Guards and Horse Guards (see GUARDS) are called Household Brigade. Two new units, the Mounted Brigades, were recently instituted, consisting of two regiments of cavalry and one battalion of mounted infantry, with a battery of horse artillery. Artillery is also grouped into brigades, both administratively and tactically—horse artillery, 2 batteries; field artillery, 3 batteries; medium siege artillery, 4 batteries; heavy, 2 batteries. The commissioned staff of an infantry brigade has an aide-de-camp, a brigade-major, and a staff-captain. In India there are 36 infantry brigades. A mixed

brigade is a force of 2000 to 5000 men, containing more than one arm.

Brigade-major is a military staff-officer who exercises duties, in a brigade, analogous to those of the Adjutant (q.v.) of a battalion. The appointment is held for four years, and is nearly always held by officers who have passed through the Staff College (q.v.). This holds also for the Territorial Army. When temporary brigades or mixed brigades are formed on manœuvres or in war, their commander is provided with a brigade-major.

Brigadier, or BRIGADIER-GENERAL, is the commander of a Brigade (q.v.). It is not a permanent rank; the officer, on vacating the command, reverts to colonel, if not promoted. In all armies the rank is next below that of major-general, but a brigade is often commanded by a colonel or a major-general. At large stations where there are one or more divisions, and where a lieutenant-general or general is in command, the brigadier usually commands a brigade proper of infantry or cavalry, but at other places an officer of this rank is often in command of a mixed force of more than one arm. This also happens in the case of detachments in war. In India the sub-districts called brigade commands have a mixed force, and are under colonels with the temporary rank of brigadier-general, which may be held for five years or until promotion. The rank of brigadier-general in the British army was abolished in 1920. That of colonel commandant answers to it.

Brigandine, a coat of mail worn during the middle ages, made of small plates of iron, sewed upon quilted linen or leather, and covered with a similar substance to hide the glittering of the metal. The brigandine was named after the *Brigands*.

Brigands (Ital. *brigante*, from *briga*, 'an intrigue or quarrel'), a name originally given to the mercenaries who held Paris during King John's imprisonment (1358), and who made themselves notorious for their ill-behaviour. It was applied by Froissart to a kind of irregular foot-soldiery (see BRIGANDINE), and from them was transferred to simple robbers; it is now used especially of such of these as live in bands in secret mountain or forest retreats. In this sense, the pest has been common to most countries, by whatever name the robbers may have been known—whether the escaped slaves and gladiators of Rome, the pre-Islamite brigands of Arabia, English outlaws and highwaymen, German robber-nobles, the later banditti of Mediterranean countries and of Mexico, American stagecoach robbers, Australian Bushrangers (q.v.), or the dacoits and hill-robbers of Asia. It has ever flourished under weak or corrupt governments, and patriotism at times has swelled its ranks, always largely recruited from those disposed readily to join in any political movement, and has transformed them into guerilla companies, who have carried on a bitter warfare against the invader. Such Spanish bands harassed the French during the Peninsular war; in Italy, the Austrian troops were frequently engaged in expeditions against the banditti led by the daring Bellino ('Il Passatore'); and in Greece, the Klephts rendered brave and worthy service in the war of independence. In Cuba, in 1888, political discontent was made the excuse for the brigandage then rampant in the island, where four provinces were on this account declared in a state of siege. Religious persecution also has encouraged brigandage; in Bosnia, which for centuries produced the most perfect specimens of bandits, it was formerly very common, the unhappy Christians, who were reduced by the Turks to the condition of serfs, frequently taking to the mountains in despair, and thence wreaking vengeance on their oppressors. Gener-

ally speaking, in countries with a notably scanty population, which is yet in many districts as notably overcrowded, brigandage is, or was recently, in existence. In Hungary, where brigandage had flourished from time immemorial, and where even the free towns in the 15th century enrolled companies for organised rapine, it found a stronghold in the shades of the Bakony Forest. Vigorous steps have been taken since the middle of the 19th century to repress the practice, and in some countries with signal success. In Greece organised companies of brigands, as distinguished from bands of highway robbers fortuitously collected, have disappeared; and in Italy the chiefs with whom princes made treaties are found only in history. Even in Sicily brigandage is all but extinct. Examples of those forms of brigandage that spring up on a racial and on a national frontier are both afforded by Scottish history. The Highland caterans used to plunder their Lowland neighbours or exact blackmail for their forbearance; while the Border reivers, accustomed to drive cattle across the Border, did not scruple to make raids on their own countrymen, as when the Liddesdale men, having 'nearhand herried hale Ettrick Forest and Lauderdale,' turned their attention upon Lothian.

Brigantes, the most powerful of the old British tribes, inhabiting, with subject tribes, the country from the Trent to the Forth, or possibly the Perthshire Almond.

Brigantine. See **BRIG.**

Brigantium, Brigantium, Latin and Greek names of Betanzos, Bregenz, and Briançon.

Briggs, HENRY, a distinguished mathematician, was born in 1561, at Warley Wood, near Halifax, Yorkshire, and studied at St John's College, Cambridge. He took the degree of B.A. in 1581, that of M.A. in 1585, and obtained a fellowship in 1588. In 1592 he was appointed reader of the Physic Lecture founded by Dr Linacre, and in 1596 first reader in geometry at Gresham House (afterwards College), London, and in 1619 first Savilian professor of Astronomy in Oxford. This office he retained till the time of his death, which took place at Oxford, January 26, 1631. Briggs made an important contribution to the theory of logarithms, of which he constructed invaluable tables. Napier the inventor had in 1614 published a table of the so-called natural logarithms, when Briggs observed that another system, in which the logarithm of 10 should be taken as unity, would afford great facilities of calculation. In 1616 he visited Napier at Edinburgh to discuss the suggested improvement, and again in the following year, when Napier admitted the improvement on his own system. He published his *Logarithmorum Chilias Prima* in 1617, containing the first thousand natural numbers calculated to eight decimal places. He was also the author of a tract on the *North-west Passage to the South Seas*, by way of Virginia and Hudson Bay (1622); and in 1624 he published his *Arithmetica Logarithmica*, the fruit of many years of unwearied application, and giving the Logarithms (q.v.) of 30,000 natural numbers to fourteen places of figures, besides the index. His system of logarithms is that now commonly adopted. He next employed himself on a Table of Logarithms of sines and tangents, carried to the hundredth part of a degree, and to fifteen places, which, with a table of natural sines, tangents, and secants, was printed at Gouda, in Holland, in 1631, and published in London in 1633, under the title of *Trigonometria Britannica*. The Greek epitaph written on him by Henry Jacobs, finishes by saying that his soul still astronomises and his body geometrisises.

Bright, JOHN, a politician, first brought into notice by the Anti-Corn-Law agitation,

son of Jacob Bright, a cotton-spinner and manufacturer at Rochdale, Lancashire, was born at Greenbank, near that town, November 16, 1811. The family were members of the Society of Friends, and Bright was educated at a Friends' school at Ackworth, and afterwards at York and at Newton. While in his father's factory he took a great interest in public questions, and before he had attained his majority spoke upon such subjects as capital punishment, church rates, temperance, and parliamentary reform. In 1835 he made a foreign tour, which included a journey to Palestine, and on his return delivered before a literary institution at Rochdale, of which he was one of the founders, lectures on the subject of his travels, and on topics connected with commerce and political economy. When the Anti-Corn-Law League was formed in 1839 he was one of its leading members, and, with Cobden, engaged in an extensive Free-trade agitation throughout the kingdom. In the spring of 1843 he offered himself as a candidate for the representation of Durham, and though at first unsuccessful, he became in July of the same year M.P. for that city. At all times an animated and effective speaker, Bright was incessant, both at public meetings and in parliament, in his opposition to the Corn Laws, until they were finally repealed. In 1845 he obtained the appointment of a select committee of the House of Commons on the Game Laws, and also one on the subject of cotton cultivation in India. An abridgment of the evidence taken before the former, published in one volume, contained from his pen an *Address to the Tenant Farmers of Great Britain*, strongly condemning the existing Game Laws. At the general election of 1847 he was elected one of the members for Manchester. He co-operated with Cobden in the movement in favour of financial reform. On the formation of the first Derby ministry, February 27, 1852, Bright aided in the temporary reorganisation of the Corn-Law League, in favour of the principles of Free-trade; and at the general election which followed, was re-elected for Manchester. Like Cobden a member of the Peace Society, he energetically denounced the policy of the Crimean war (1854). A severe illness compelled him to withdraw for a time to the Continent, and in his absence he was rejected by Manchester. Elected in 1857 for Birmingham, he seconded the motion against the second reading of the Conspiracy Bill, which led to the overthrow of Lord Palmerston's government. Mr Bright advocated the transference of India to the direct government of the crown, together with other reforms affecting our eastern dependency. When the civil war in America broke out, he warmly supported the cause of the North, although his own business and the whole of the Lancashire cotton-trade suffered severely in consequence. His name next became chiefly associated with the movement for reforming the electoral representation, which resulted in the Act of 1867. In 1868 he accepted office as President of the Board of Trade, but in 1870 was again obliged to retire in consequence of severe illness. His health having been restored, he took office in 1873, and again in 1881, as Chancellor of the Duchy of Lancaster; he was appointed Lord Rector of Glasgow University in November 1880. Mr Bright retired from the Gladstone ministry in 1882, being unable to support the government in its Egyptian policy. His appearances in public were afterwards infrequent; but in 1883 he defended himself in the House of Commons from a charge of breach of privilege in connection with speeches delivered at Birmingham. His completion of 25 years of service to this town was marked by a series of popular demonstrations there, in June 1883. In 1886-88 he opposed the Home Rule policy of Mr

Gladstone. He was one of the most eloquent public speakers of his time. He died 27th March 1889.

A collection of his speeches was published in 1868; Lives by Robertson (1877), R. Barry O'Brien (1910), and G. M. Trevelyan (1913); his *Life and Speeches*, 2 vols., by G. Barnett Smith (1881); and his *Public Letters* (ed. by Leech, 1885).

Bright, RICHARD, physician, was born at Bristol, 28th September 1789, and studied at Edinburgh, Berlin, and Vienna, and from 1820 was connected with Guy's Hospital. He died 16th December 1858. He made many important medical observations (see BRIGHT'S DISEASE) and wrote numerous medical dissertations. His *Travels through Lower Hungary* (1818) contains a valuable account of the Gypsies.

Brighton, a parliamentary and county borough and fashionable watering-place in East Sussex, 50½ miles S. of London by rail. Its former name, *Brighthelmston*, was superseded in the 19th century by *Brighton*, which occurs, however, as early as the 14th. The town is built on a slope ascending eastward to a range of high chalk cliffs; to the west these hills recede from the coast; and within easy reach in the South Downs is the Devil's Dyke, 5 miles distant. Hove, Portslade, Southwick, and Shoreham continue the town westwards. Ancient Brighthelmston was a mere fishing-village on a level under the cliff. It suffered much at the hands of French, Flemings, and Spaniards, and still more from the sea, whose inroads in 1699, 1703, and 1706, undermined the cliffs and destroyed many houses. During excavations in 1818 the walls of some of the old streets were found under 15 feet of beach. Further inroads are prevented by a sea-wall of great strength (60 feet high and 23 feet thick at the base), extending along the east cliffs, and built between 1827 and 1838 at a cost of £100,000, the money being raised by the imposition of a duty on all coal entering the town. This duty was abolished in 1887, the whole of the debt having been paid off. The writings of Dr Richard Russell, a celebrated physician, first drew public attention about 1753 to Brighton as an eligible watering-place, and the discovery of a chalybeate spring in the vicinity increased its popularity. Dr Johnson in 1770 described the country as 'so desolate, that if one had a mind to hang one's self for desperation at being obliged to live there, it would be difficult to find a tree on which to fasten a rope.' Now the growth of trees is encouraged, and they have been freely planted both in and around the town. The visit of the Prince of Wales in 1782, and his subsequent yearly residence there, finally opened the eyes of the fashionable world to Brighton's immense attractions, and it thenceforth became the crowded resort of a health-seeking population, in which the opening of the Brighton Railway in 1841 greatly assisted. It was made a parliamentary borough in 1832, a municipal one in 1854; its progress has been very rapid, and the town is still steadily increasing. Brighton is for the most part extremely well built, as becomes a favoured retreat of wealth and aristocracy. It mostly consists of new and elegant streets, squares, and terraces. Kemp Town, as the east end of Brighton is called, has a famous crescent and square. The public hotels are magnificent; besides these there are the boarding-houses and many hundreds of lodging-houses. A range of splendid houses fronts the sea for upwards of 4 miles, the promenade—asphalted from end to end, and exceptionally well lighted—being almost on a dead level, within a few feet of the sea, for the greater part of its length, but rising at the east end of the town to a height of 60 feet, on the top of the sea-wall already referred to. Beneath this is the Madeira Road, a fine drive and promenade a mile in length,

sheltered effectually from the north wind. The population is greatly increased during the fashionable season by the influx of many thousands of visitors, chiefly from London, for which reason it is sometimes called London-super-Mare. There are more than thirty churches, that of St Nicholas, dating from the time of Henry VII., and restored in 1853, being the only ancient building, and more than fifty chapels. Holy Trinity Church has been rendered famous from the ministry of F. W. Robertson. The public buildings include the town-hall, the town-hall in the adjoining borough of Hove (part of the parliamentary borough, but not included for municipal purposes), the unrivalled aquarium (1872), library and art gallery, museum, school of science and art, Brighton college, theatre, Sussex county hospital, workhouse, blind asylum, various bathing establishments, and an abundant supply of good schools. At Queen's Park, in the east of the town, is the German Spa establishment, and at St Anne's well and wild gardens, in the west, is a chalybeate spring. In the north of the town is the Preston public park of 67 acres, which was opened in 1884, and cost £50,000, the money being left to the town by the 'Leviathan' bookmaker, Mr W. E. Davies (1819-79). Hollingbury Park (240 acres) is near the north boundary.

Near the centre of the town is the Royal Pavilion or Marine Palace, a fantastic oriental or Chinese structure, with domes, minarets, and pinnacles, and Moorish stables, begun for the Prince of Wales in 1784, and finished in 1827. It was purchased in 1850 for £53,000 by the corporation, and with its fine pleasure-grounds it is devoted to the recreation of the inhabitants. The concert-hall known as the 'Dome,' formerly the royal stables, can accommodate 3000 people. Adjoining are the public library and museum and picture-gallery. The site of the Pavilion is in the Steyne Valley, which is practically in the centre of the Brighton sea-front, and the starting-point of the main road to London. The Marine Parade is an esplanade extending some three or four miles along the coast. The famous Chain Pier (1823), 1136 feet in length, was destroyed by a storm in 1896; the much wider West Pier (1866) is 1350 feet long; the Palace Pier, completed in 1900, near the site of the old Chain Pier, is 1700 feet long. Numerous groynes to intercept the shingle constantly moving from west to east, and thus protect the promenade, intersect the beach from north to south. Most of these are of stout timber, but two are costly concrete structures, 21 feet wide at the top, and these are favourite promenades. Brighton has no maritime trade, but there is some mackerel and herring fishing. The water-supply, which is in the hands of the corporation, and has cost £450,000, is derived from the chalk, and is practically inexhaustible. The Municipal School of Art, erected in 1876, was extended in 1911. The Municipal Technical College was opened in 1898, and extended in 1906. The electric power station at Southwick (outside the borough) yields a large profit to the town, which has electric tramways and lighting. The suburb of Preston is incorporated with the municipal borough; Hove, in the parliamentary borough, which returns two members, received a separate municipal charter in 1898. Pop. (1801) 7339; (1821) 24,429; (1841) 46,661; (1861) 77,693; (1881) 107,546; (1891) 115,873; (1911) 131,237; (1921) 142,427; of parliamentary borough, 188,946.

See works on Brighton by Erredge (1862), J. Bishop (1875-95), Sawyer (1878), Sala (1895), Lewis Melville (1909), and on the 'Brighton Road' by C. G. Harper (1892).

Brighton, a watering-place of Victoria, on Port Phillip Bay, 8 miles S. of Melbourne; pop. 11,000.

Bright's Disease (of the kidneys), so called after Dr Richard Bright (q.v.), who first investigated its character. In 1827 he published a work in which he showed that dropsy is frequently associated with inflammatory changes in the kidneys, and an abnormal condition of the urine. When we apply heat or certain chemical reagents to the urine in such a case, it becomes opaque, showing that it contains *Albumen* (q.v.); and on examining the sediment under the microscope, we see exuded material mixed with epithelium in the form of casts of the small ducts of the diseased organ. Further research has shown that these conditions of the urine occur in connection with several distinct affections of the kidney, varying much in duration, severity, and danger to life; and, while Bright's disease is retained as a generic term for the whole group, more precise names are applied to the several diseases included in it—e.g. acute nephritis, chronic nephritis, and fibrotic or granular kidney. See KIDNEY (DISEASES OF).

Brigitta. See BRIDGET.

Brignoles, a town in the French department of Var, 42 miles ESE. of Aix by rail. A very salubrious place, it has a trade in wines, brandy, olives, and prunes. Pop. 3000.

Brihuega, a town of New Castile, Spain, on the Tajuña, 20 miles ENE. of Guadalajara; pop. 5000. Here in 1710, during the War of the Succession, the English general Stanhope, owing to the dilatoriness of his allies in affording him support, was defeated by the Duke de Vendôme, and compelled to surrender, with all his force, amounting to about 5500 men.

Bril, the name of two landscape painters, both natives of Antwerp.—**MATTYS BRIL** (1550–84) went during his youth to Italy, and, under the patronage of Pope Gregory XIII., painted several frescoes in the Vatican. He was also distinguished as an historical and landscape painter.—His more celebrated younger brother, **PAUL BRIL** (1556–1626), received instruction under Mattys in Rome, and soon excelled his master. The works of his riper age exhibit high poetical qualities, and a fine appreciation of the effects of light in the sky, which have been described as but little inferior to those of his great successor, Claude Lorraine. They have a character of solemn rest and calmness, and at times even an elegiac tone of melancholy, which well accords with representations of the glories of fallen Rome.

Brill, a Dutch port. See BRIEL.

Brill (*Rhombus levis*), a common flat fish on British and other European coasts, belonging to the same genus as the Turbot (q.v.), from which it is distinguished by its being much less high in proportion to length, by the absence of bony tubercles, by the small, almost smooth scales, by the different curve of the lateral line, by the reddish-brown spots on the grayish brown of the 'upper' side, &c. It is seldom above 8 lb. in weight, is much eaten, but lacks the firmness and delicacy of turbot.

Brillat-Savarin, **ANTHELME**, French gastronomist, born at Belley, 1st April 1755, was a deputy in 1789, and mayor of Belley in 1793; he resided for a time in Switzerland, and afterwards in America, where he played in the orchestra of a theatre in New York; and from 1796 until his death, 2d February 1826, he was a member of the Court of Cassation. Shortly before this event, appeared his *Physiologie du Goût* (1825), an elegant and witty compendium of the art of dining, to which he brought the experience of half a century. It has been repeatedly republished and translated; the latest English form is *A Hand-*

book of Gastronomy, with 52 etchings by Lalauze (1884).

Brilliant is a popular name given to the diamond when cut in a particular way. See DIAMOND.

Brimstone ('a stone that burns'; from Anglo-Saxon *byrnan*, 'to burn,' and 'stone') is the commercial name for Sulphur (q.v.) in sticks or rolls.

Brindában, or **BINDRABAN**, a town of the United Provinces of Agra and Oudh, on the Jumna, 6 miles N. of Muttra. It is one of the holiest cities of the Hindus, and crowds of pilgrims come from all parts of India, more particularly in honour of Krishna, who passed most of his youth here; and here his mistress Radha loved to dwell. Amongst the most notable temples are those of Gobind Deva (1590), Madan Mohan, Gopinath (1580), and that of the Seths, erected between 1845 and 1851 at a cost of about £450,000. Here, as at Benares, the immediate margin of the river is occupied by flights of steps or ghauts. The inhabitants are almost exclusively Hindu. Pop. 18,000.

Brindisi (the ancient *Brundisium* or *Brundisium*), a seaport town of Southern Italy, in the province of Lecce, is situated on a small promontory in a bay of the Adriatic Sea, 346 miles SE. of Ancona by rail. A place of very great antiquity, it was taken from the Sallentines by the Romans (267 B.C.), who some twenty years later established a colony here. It rapidly increased in wealth and importance, chiefly on account of its excellent port—consisting of an inner and outer harbour, the former perfectly landlocked, and capable of containing the largest fleets, and the latter also very well sheltered. Indeed, it soon became the principal naval station of the Romans in the Adriatic, and attained a population of 100,000. Horace has made a journey to Brundisium the subject of one of his satires (*Sat.* i. 5), and Virgil died here (19 B.C.) on his return from Greece. The city suffered greatly in the wars which followed the fall of the empire. When the Normans became possessed of it in the 11th century, the Crusaders made it their chief port for embarkation to the Holy Land; but with the decline of the crusades, the port again sank into insignificance. The city subsequently suffered greatly from wars and earthquakes. The principal buildings are the cathedral (1150), lately restored; and the castle, commenced by the Emperor Frederick II., and finished by Charles V. The neighbouring district is still remarkable for its fertility, olive-oil being largely produced. After the establishment of the Overland Route (q.v.) to India, Brindisi became a standard point of departure for passengers for the East. Since 1898, however, when the Peninsular and Oriental Company made Marseilles the starting-point of their main-line steamers, the number of passengers travelling by Brindisi has been very greatly diminished. So far as the carriage of mails is concerned, the port retains its importance. Since 1866 great quays and breakwaters have been added, and the entrance channel deepened. Brindisi exports casks, wine, figs, hats, &c. An important wireless station, with government coal and oil depots, Brindisi has manufactures of briquettes and wine and oil casks. The city is the seat of an archbishopric. Pop. 28,000.

Brindley, **JAMES**, an eminent English mechanic and engineer, born in Thornsett, near Chapel-en-le-Firth, Derbyshire, in 1716. His parents being in poor circumstances, he received very little education; he was apprenticed at seventeen to a millwright, afterwards became an engineer, and in 1752 showed great ingenuity in contriving a water-engine for draining a coal-mine. A silk-mill on a new

plan, and several others of his works, recommended him to the Duke of Bridgewater (q.v.), who employed him to execute the canal between Worsley and Manchester. This difficult enterprise was crowned with success, including the remarkable aqueduct over the Irwell at Barton, 39 feet above the river, removed in 1888, to give place to a steel aqueduct in connection with the Manchester ship-canal. Thenceforth he devoted his great skill and genius to the construction of navigable canals; commenced the Grand Trunk, and completed the Birmingham, Chesterfield, and others. He appears to have constructed or laid out 365 miles of canals. Up till the last he remained illiterate, most of his problems were solved without writings or drawings, and when anything specially difficult had to be considered, he would go to bed and think it out there. Once, when under examination before a committee of the House of Commons, being jocularly asked for what purpose he supposed rivers to have been created, he is said to have replied: 'Undoubtedly to feed navigable canals.' His life was shortened by his excessive thought and labour, and he died at Turnhurst, Staffordshire, 30th September 1772.

Brine-shrimp (*Artemia*), a genus of small crustaceans, in the Phyllopod sub-order, occurring in salt-lakes and brine-pools in the northern hemisphere. The body has eleven pairs of flattened swimming-limbs. The animals swim actively and gracefully on their backs. They are hatched at

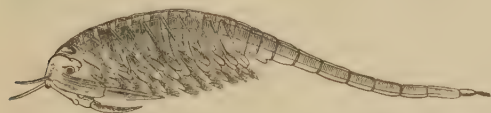


Fig. 1.—Side View of Male Brine-shrimp (*Artemia salina*), enlarged.

the lowest level of crustacean life as nauplii (see CRUSTACEA). The full-grown animal is about half an inch long, and, having no shell, is transparent. The male has a strong embracing organ, the female a pouch-like brood-sac. The multiplication is very rapid. There are five species of *Artemia*, all found in salt-lakes or in brine-pools where salt is manufactured. Of these species the most unlike are *A. salina* and *A. milhausenii*. Schmankewitsch found that an increase in the salinity of the water containing the typical form called *Artemia salina* led to its being replaced in the course of generations by the form called *Artemia milhausenii*. He also made the converse experiment. The two forms are varieties rather than species, and are connected by intermediate stages. In respect of habitat, the brine-shrimp is indeed remarkable, occurring, as it does, in myriads, in the concentrated brine of salt-pans. The workmen at salt-pans so confidently ascribe to it the rapid clearing

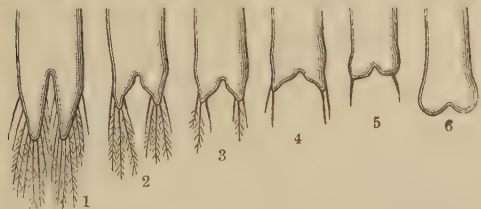


Fig. 2.—Transformation of *A. salina* to *A. milhausenii*: 2, tail-lobe of *A. salina*, and its transition through 2-5 into 6, that of *A. milhausenii*. (After Schmankewitsch.)

of the brine in which it occurs that when it does not appear in their salt-works they transport a few from other pools. See Bateson, *Materials for the Study of Variation* (1894).

Brinjal, an Anglo-Indian name for the Egg-plant (q.v.).

Brink, BERNHARD TEN, philologist, born at Amsterdam in 1841, from 1861 to 1865 studied philology at Münster and Bonn, and in 1870 became professor of Modern Languages and Literature at Marburg, in 1873 at Strasburg. Among his works (in German) are two books on Chaucer (1870 and 1884), a history of English literature (1874-93; Eng. trans. 1883-96) left incomplete, one on Beowulf (1882), and lectures on Shakespeare (1893; Eng. trans. 1895). These works are still of very great value. His work on Chaucer stimulated a revival of Chaucer study not only in Germany, but also in Britain. He died at Strasburg 29th January 1892.

Brink, JAN TEN, a Dutch writer, born 15th June 1834 at Appingadam, studied theology at Utrecht, but early devoted himself to literary studies. After a short residence at Batavia, he returned in 1862 to lecture on Dutch at the Hague, and earned for himself a foremost place as a critic of acuteness and insight, especially in the department of fiction and belles-lettres. A popular novel of his own is *Het verloren Kind* (1879); and his *Causerien over Moderne Romans* (1885) is a valuable critique of modern novels.

Brinkley, JOHN (1763-1835), born at Woodbridge, graduated from Caius College, Cambridge, as senior wrangler, and became in 1792 first Irish Astronomer Royal, in 1826 Bishop of Cloyne.

Brinsmead, JOHN (1814-1908), founded a London piano house in 1836.—His son EDGAR wrote a *History of the Pianoforte* (1870), and died in 1908.

Brinton, DANIEL GARRISON (1837-99), American ethnologist, was born at Thornbury, Pennsylvania. He was an army surgeon, and afterwards professor of American linguistics and archaeology in the university of Pennsylvania. His chief work is the *Library of American Aboriginal Literature* (8 vols 1882-85).

Brinvilliers, MARIE MADELEINE, MARQUISE DE, poisoner, was the daughter of Dreux d'Aubray, lieutenant of Paris, and in 1651, while still young, was married to the Marquis de Brinvilliers. A gay and careless spendthrift, he allowed her to do very much as she pleased, and even introduced to her a handsome young officer, the Seigneur de Sainte Croix, who inspired her with a violent passion. Her father caused Sainte Croix to be arrested and imprisoned in the Bastille, where he learned from an Italian the properties of arsenic. On his release he imparted his fatal knowledge to his mistress, who during his incarceration had affected the greatest piety, spending most of her time in visiting the hospitals and in attending the sick. She now resolved to destroy her father, and, to test the efficacy of the poison, tried its effects on patients in the *Hôtel Dieu*. Having satisfied herself, she commenced operations on her parent, kissing and poisoning him continually for eight months, until her diabolical patience was exhausted, and she was at last induced to administer a very violent dose. He died, and no one suspected his daughter, who, aided by Sainte Croix and a domestic, Jean Amelin or Chaussée, next poisoned her two brothers and her sisters, her object being to find means of supporting her extravagant style of living with her paramour. She made several attempts to poison her husband; but Sainte Croix is said to have given him antidotes, dreading that he should be compelled to marry the widow. Sainte Croix died suddenly in 1672—his glass mask having fallen off while he was engaged in preparing a poison—and left documents inculcating the marchioness. She escaped to England, afterwards travelled into Ger-

many, and next took refuge in a convent at Liège. From this, however, she was decoyed by an officer of justice disguised as an abbé, and conveyed to Paris. Among her papers was found a general confession of her crimes, whose truth she acknowledged after having been put to the torture, and on 16th July 1676 she was beheaded and burned at Paris (see *CHAMBRE ARDENTE*). Scribe made her the subject of a comic opera, and Albert Smith of a romance (1856). See books on her by Bauplein (1871), Toiseleur (1883), and Hugh Stokes (1911).

Brioude, a town in the French department of Haute-Loire, 34 miles SSE. of Clermont, with a 12th century Romanesque church; pop. 4000.

Briquette (*Fr.* 'small brick') is the name applied to a form of fuel made by moulding, under the combined influence of heat and pressure, a mixture of small coal with pitch, or other suitable binding material, so as to make a coherent block suitable for transport. By such means a vast amount of otherwise waste colliery slack or culm can be converted into a useful fuel for domestic and industrial purposes. The process of manufacture is quite simple in principle. The small coal, which should be previously washed free from particles of clay, shale, gypsum, pyrites, &c., is first of all well dried in some suitable form of oven, and then passed, together with the requisite proportion (6 to 8 per cent.) of pitch, through (1) a disintegrator, and (2) a vertical pug-mill, which thoroughly mixes the two ingredients. Steam is introduced into the pug-mill in order to soften the binder and render it viscid and adhesive. The mixture, thus thoroughly amalgamated, is then forced from below into brass-lined moulds fixed on a vertical revolving table by rams, exerting a pressure of 20 lb. or more per square inch. After half a revolution of the table the contents of the mould are further pressed by a plunger, up to a pressure of 2 tons per square inch in some cases. After another quarter-revolution of the table the briquette is pushed out of the mould on to an endless band and cooled by a current of air from a fan. The briquettes are usually rectangular in shape, a convenient size being 6×5×4 inches (although larger are made), weighing about 7 lb. each. The specific gravity averages 1.2 and weight 50 lb. per cubic foot. The calorific value is somewhat higher than that of the coal from which the briquette is manufactured. Briquettes are chiefly used in Britain for domestic consumption, but in certain parts of America and Europe they are largely employed as locomotive fuel on the railways. Extensive experiments have been made under government auspices in the United States on the subject of briquetting (see U.S. Bureau of Mines, *Bulls.* 343, 385; and U.S. Geol. Survey Report on the Coal-testing Plant at the St Louis Exposition, 1904, part iii.).

Brisbane, the capital of Queensland, a sea-port and chief seat of trade in the state, is situated about 500 miles N. of Sydney, in Moreton district. It stands about 20 miles by water from the mouth of a river of its own name, which falls into Moreton Bay, and it is divided into the four divisions of North Brisbane, South Brisbane, Kangaroo Point, and Fortitude Valley. Pop. (1876) 26,911; (1881) 31,109; (1901) 54,315, or within a five-mile radius 119,428; (1921) 85,837, or with suburbs 200,000. The iron bridge (1022 feet long) connecting North and South Brisbane took the place of that destroyed by the flood of 1893, which laid half of South Brisbane in ruins. Brisbane possesses broad and handsome streets and some fine buildings, among the chief of which are the Houses of Legislature, which cost £125,000, and the new Government Buildings. Other buildings of importance are the post and tele-

graph office, town-hall, custom-house, Queensland club, museum, and the former Government House, later used to accommodate the university of Queensland. Brisbane is the seat of an Anglican and of a Roman Catholic bishop. There are some forty churches, the chief being the two cathedrals; and several daily and weekly newspapers are published. There are four parks and well-laid-out botanic gardens. Brisbane is very well lighted, and supplied with water from several inexhaustible sources. It is the fourth port in the Commonwealth. Regular steam communication is kept up with the other Australian ports, as well as with London (11,295 miles), and there is an extensive system of wharfs on both sides of the river. The channel of the river has been deepened, and the approach through Moreton Bay straightened, providing a channel 400 feet wide, with a minimum depth of 24 feet at low water. South Brisbane, on the south side of the Brisbane River, is a favourite place of residence, has good wharfs, and a spacious dry-dock, opened in 1881. Brisbane is the terminus of railways to the southern border and Sydney, to Cunnamulla in the far west, and (*via* Rockhampton) to Longreach in Central Queensland. A scheme is now in progress whereby through connection will be given to Cairns, 1000 miles north. The university of Queensland, established in 1909, was opened to students in 1911.

Brisbane was occupied in 1824 by Sir T. Brisbane (q.v.), governor of New South Wales, as a penal settlement for convicts of specially bad character. Shut off from the pastoral country inland (which traded directly with Sydney) by the precipitous Dividing Range, as well as by regulations which forbade free men to come within 60 miles of the settlement, the township grew slowly, and in 1836 comprised the houses of the commandant and other officers, barracks, a tread-mill, stores, &c. In 1842, however, transportation to New South Wales having been abolished, Sir G. Gipps had the town site surveyed and thrown open for sale; but it was not until Queensland became in 1859 a separate colony, with Brisbane as its capital, that the prosperity of the town and district became steady and rapid. The climate on the whole is dry and healthy, with a high summer temperature, the mean temperature in the shade being 70° F. Race-meetings are held at the Ascot racecourse in one of the eastern suburbs. The Brisbane River rises in the Burnett Range, and receives the Bremer and other rivers before its entrance into Moreton Bay, below the town of Brisbane.

Brisbane, GENERAL SIR THOMAS MACKDOUGALL, soldier and astronomer, was born at Brisbane House, Largs, Ayrshire, July 23, 1773. At the age of sixteen he entered the army, and served with distinction in Flanders, the West Indies, Spain, and North America. In 1821, on Wellington's recommendation, he was appointed governor of New South Wales, a position he held for four years. Towards the end of his term the reforms in penal and land administration which had been recommended by Commissioner Bigge were put into force; the colony received a constitution (1823), a supreme court, and in certain cases trial by jury; and settlers were attracted from England by grants of land proportioned to the live-stock they owned and the convicts they were willing to employ. To provide new jails for other convicts explorations were made along the coast, in the course of which Surveyor-general Oxley discovered the Brisbane River (1823). While in Australia, Brisbane catalogued no less than 7385 stars, and received the Copley medal from the Royal Society. In Scotland, he had an astronomical and a magnetic observatory established at his residence. He was president of the Royal Society of Edinburgh after Sir Walter

Scott. He was made a baronet in 1836, and a G.C.B. in 1837. He died January 27, 1860.

Brissot, JEAN PIERRE, one of the leaders of the French Revolution in its early stage, and afterwards numbered among its victims, was born at Chartres in 1754, and educated for the bar. After completing his studies at Paris, he went into the office of a procurator, but quickly abandoned the legal profession for the more congenial one of authorship. From his earliest years he had devoted himself with passionate eagerness to literary studies, especially history, economy, and politics. His first work, *Théorie des Lois Criminelles* (1780), gained the approbation of the best judges, and was followed by his *Bibliothèque des Lois Criminelles*, which established his reputation as a jurist. He was imprisoned in the Bastille on the false charge of having written a brochure against the queen; but after four months was liberated through the intervention of the Duke of Orleans. His love of freedom again involved him in danger, and to escape from a new term in the Bastille he retired to England. He afterwards visited North America as representative of the *Société des Amis des Noirs*. On the outbreak of the Revolution in 1789 he returned to France, and was elected by the citizens of Paris their representative in the National Assembly, where he exercised a predominant influence over all the early movements of the Revolution. He also established a journal called *Le Patriote Français*, which became the recognised organ of the earliest Republicans. As the Revolution proceeded, Brissot was recognised as the head of the party usually called Girondists (q.v.), from Gironde, the province to which most of them belonged, but also named Brissotins after their leader. Brissot contributed powerfully to the fall of the French monarchy, and strongly enjoined war against Austria and England, and the diffusion of republican principles throughout Europe. In the Convention, his moderation made him suspected as a friend of royalty, as he opposed the 'men of September' and the trial and condemnation of the king. When Louis XVI. heard his doom pronounced, he exclaimed: 'I believed that Brissot would have saved me!' But Brissot was weak enough to imagine that the best way to save the king would be to vote first for his death, and then appeal to the nation. Brissot and his party, perhaps the purest in principle and the weakest in action, ultimately fell before the fierce accusations of the Mountain or Jacobin party, which believed, or at least pretended to believe, that the virtuous Brissot had received money from the court to employ against the Revolution. With twenty other Girondists, Brissot was guillotined, October 31, 1793. See his *Memoirs* (*Legs à mes Enfants*, ed. by Lescure, 1885), and a study by E. Ellery (1916).

Bristle-fern (*Trichomanes radicans*), one of the Filmy Ferns (q.v.) found in Ireland and rarely in Britain, so called from the bristle projecting from its indusium on the leaf-margin.

Bristles, the strong hairs growing on the back of the hog and wild-boar, and extensively used in the manufacture of Brushes (q.v.), and also by shoemakers and saddlers. They form an important article of British import, and are obtained chiefly from Russia and Germany, but also from France, Belgium, Denmark, Holland, the United States, India, and China. The quality of bristles depends on the length, stiffness, colour, and straightness—white being the most valuable. The best bristles are produced by hogs that inhabit cold countries. The Russian hog is a long, spare animal, and the thinner the hog, the longer and stiffer the bristles. In the summer the hogs are driven in herds through the forests, to feed on soft roots, &c., when, by

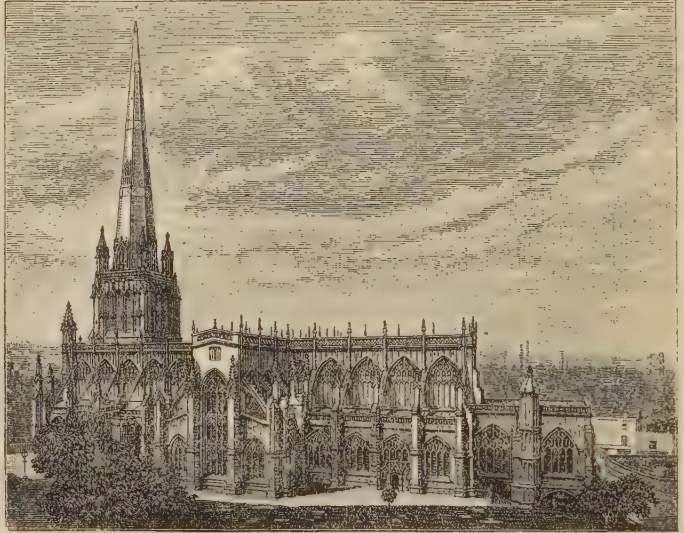
rubbing themselves against the trees, they shed their bristles, which are collected and sold.

Bristle-tails. See THYSANURA.

Bristol, a mercantile city 6 miles from the mouth of the Avon, and at its junction with the Frome, is locally partly in Gloucestershire and partly in Somerset, but since 1373 has been itself a county. In 1888 it was made a county borough. Between 1836 and 1904 the city was enlarged four times; in 1885 its parliamentary representation was increased from two to four; in 1918 to five. Since 1899 its chief magistrate has been styled Lord Mayor. The dock undertakings of the corporation are by far its most important enterprise, and shipbuilding and associated trades are great industries. The manufactures are varied, including cocoa, chocolate, leather, boots and shoes, soap, pottery, chemicals, spelter, beer, iron goods, machinery, glass, brass and copper wares, cotton, and sugar (once the staple product). Pop. (1801) 61,153; (1821) 125,148; (1881) 206,503; (1911) 357,048; (1921) 377,061. The ancient town stood wholly on the north of the Avon, on a peninsula formed by that river and the Frome, which then flowed across the bottom of Corn Street; a new course was dug for the Frome in 1248, and this added a large area; and soon afterwards a stone bridge was built across the Avon, connecting the town with Temple-fee, and with Redcliff, which belonged to the lords of Berkeley. After a violent struggle with the House of Berkeley, these districts were included in the town and county by the charter of 1373. The castle, first built probably by Geoffrey, Bishop of Coutances, and rebuilt with a vast keep by Robert, Earl of Gloucester (died 1147), fell into decay, and was demolished in 1654; some remains may be seen in Castle and Tower streets. The cathedral was formerly a church of Augustinian canons (1148); the nave and aisles, pulled down for rebuilding in 15th century, were rebuilt in 1877; the choir is good 14th-century work; a fine Norman chapter-house and gateway remain. Bristol, originally in the diocese of Worcester, was created a see and a city in 1540, with the abbey-church of St Augustine's as cathedral, and was united to the see of Gloucester in 1836; the see was re-erected in 1897. Other noteworthy churches north of the old course of the Avon are St James' (Benedictine), with fine Norman work, and showing the division of the building into parochial and monastic churches; St Philip's and St Jacob's, St Stephen's, All Saints, and the Mayor's Chapel. South of the river is St Mary Redcliff, justly declared by Queen Elizabeth to be the 'fairest and most famous parish church in England.' Of the church rebuilt, 'from the cross aisles downwards,' by William Canynges, sen., merchant (circa 1376), only the south transept and south wall of nave remain; the rest was wrecked by the fall of the spire, and was built by Canynges' grandson and namesake (circa 1470); it is vaulted throughout, and is a magnificent specimen of Perpendicular architecture. The truncated spire was completed in 1872. In the muniment-room is the chest in which Chatterton (1752-70) pretended to have found the Rowley poems. The present Temple Church, on the site of an oval church of the Templars, was built in the 14th century; the tower leans about 5 feet, through a defect in the foundations; attached to the church is the Weavers' Chapel of St Katharine. Among the ancient houses of the town are Canynges' house, Redcliff Street, Spicer's (or Back) Hall, and St Peter's Hospital. The principal educational institutions are the university (1909, formerly University College, 1876, with very fine buildings erected at the expense of Messrs G. A. and H. H. Wills); Clifton College (1862); the grammar-school (1531);

the Merchant Venturers' Technical School; and the charitable foundations, Queen Elizabeth's Hospital (1586), the Red Maids' School (1621), and Colston's School (1704), now in Stapleton. The City Library (free) dates from 1613. Bristol first appears in history on a coin *circa* 1000. The town, which derived its early wealth from exporting slaves to Ireland, took a large part in the war of Stephen's reign, and was besieged by the king. The first charter was granted by Henry II., who also (1171) gave Dublin to the men of Bristol. By 1217 the town had a mayor. In the reign of Edward II. the burghers made an insurrection, stood a siege, and were not brought to obedience for nearly four years. The town did a large trade in wool, leather, wine, and salt, was famous for its cloths, and was one of the 'staple' towns (1353). In the next century its trade was in the hands of great merchants, many of them, like Canynges, men of princely liberality, and generally on the Yorkist side. Bristol took a prominent part in discovery and colonisation. In 1497 John Cabot sailed from the port, and was the first to discover North America; his son Sebastian was probably born in Bristol, and sailed with his father on this voyage. Bristol men colonised Newfoundland, engaged in several early attempts to colonise Maine, and established a large trade with the West Indies and American colonies. The city was taken by Prince Rupert in 1643, and by Fairfax in 1645. Colston the philanthropist (1636-1721) founded many charities, and his 'day' is annually kept in Bristol. In the 18th century privateering was largely carried on, and was encouraged by the success of Captain Woodes Rogers in 1708-10. Other famous names connected with Bristol and Clifton by birth and residence are those of Grocyn, Wraxall, Cottle, Sir T. Lawrence, T. L. Beddoes. Southey (1774-1843) was a native of Bristol, and he and Coleridge were much there in their younger days. Burke was returned for the city in 1774, and declined the poll in 1780. One of his chief supporters was Champion (1743-1791), maker of the famous Bristol china; true Bristol china is the product of 1773-81 only. The Reform riots of 1831 occasioned great loss of life and property. The first steam-ship for the transatlantic voyage, the *Great Western*, was built in the port in 1838. Strenuous efforts have been made to improve the dock accommodation; in 1809 the Avon for about 3 miles was turned into a floating harbour. In 1884 the corporation purchased the large docks at Avonmouth and Portishead, which, with the Royal Edward Dock at Avonmouth, opened in 1908 (one of the best-equipped docks in the United Kingdom), now count as within the port of Bristol. There is a large trade with America, the West Indies, and other oversea regions. The principal imports are grain, provisions, oils, hides, tallow, sugar, and petroleum; the exports, coal, salt, tin-plates, cotton piece-goods, chemical products, oils, and sundries. The art gallery dates in its present shape from 1905. The Hotwell, noticed by the Bristol chronicler, William Worcester (died *circa* 1491), was a fashionable resort during the later half of the 18th century (see *Humphry Clinker* and *Evelina*); it is now reviving after decay. Clifton, the parish to which it belongs, has thriven. It is mentioned in

Domesday, but has little history till it appears as a 'beautiful village' in 1760; it is now a large and handsome suburb of Bristol, of which it forms part for municipal and parliamentary purposes. It stands above St Vincent's Rocks, which rise majestically from the Avon. The river is spanned 245 feet above high-water by a suspension bridge (1864; see BRIDGE). Clifton is well furnished



The Church of St Mary Redcliff, Bristol.

with places of worship, and has a zoological and botanical garden (1836), fine arts academy (1858), observatory, museum, libraries, and other public buildings. In the neighbourhood are the remains of some Roman camps.

Bristol, (1) a city of Connecticut, 15 miles SSW. of Hartford, with foundries, machine-shops, factories for clocks, brass goods, &c.; pop. 20,000. —(2) A town of Bucks county, Pennsylvania, on the Delaware River, 20 miles NNE. of Philadelphia by rail or river. Here is the terminus of the Delaware Canal from Easton (Pa.), and a line of steamboats also connects the town with Philadelphia. It has a foundry, and manufactures of machinery, flour, felt, worsted, and furniture. Pop. 10,000. —(3) A port of entry and capital of Bristol county, Rhode Island, on Narragansett Bay, 15 miles SSE. of Providence by rail, with shipbuilding and sugar-refining, and manufactures of cotton and rubber goods. Pop. 11,000. —(4) A town of Tennessee and city of Virginia, with a joint population of 15,000 (8000 in Tennessee, 7000 in Virginia), the state boundary running through the principal street. There are iron and lumber industries.

Bristol Bay, an arm of Behring Sea, lying immediately to the north of the peninsula of Alaska, receives the waters of two large lakes, by which communication with the interior is opened up for a considerable distance.

Bristol Channel, an inlet of the Atlantic Ocean, in the south-west of England, between South Wales on the north, and Devon and Somerset shires on the south; or it may be regarded as an extension of the estuary of the river Severn. It is about 80 miles long, and 5 to 43 miles broad; the depth ranging from 5 to 40 fathoms. It is the largest inlet or estuary in Britain, having a very irregular coast-line of 220 miles. The chief rivers

entering it are the Towy, Taff, Usk, Wye, Severn, Avon, Axe, Parret, Taw, and Torridge. The tides rise to a great height—at Portishead, 35½ feet; at the mouth of the Avon, 40 feet; and at Chepstow, 53 feet or more. The rapid flow of the tides meeting the currents of the river produces, in the narrow parts of the channel, and in the mouths of one or two of the rivers which enter it, the phenomenon of the *Bore* (q.v.), the tide advancing like a wall of water sometimes 6 to 9 feet high. The chief bays and harbours are Caermarthen and Swansea Bays, Cardiff Roads, on the north, and Bideford or Barnstaple, Ilfracombe, Minehead, Porlock, and Bridgwater, on the south.

Brisure, in Heraldry, is a variation on the original arms of a family, introduced to distinguish cadets from the head of the family and from each other. See CADENCY, HERALDRY.

Britain. See GREAT BRITAIN, NEW BRITAIN.

Britannia, or BRITANNIA, the name applied by Roman writers to the island of Great Britain. According to Rhys, *Britannia* has nothing to do with the Welsh *brith*, 'spotted, tattooed,' from which it is commonly derived; but 'so far as we know, the only Celtic words which can be of the same origin are the Welsh vocables *brethyn*, "cloth," and its congeners;' in which case the Britons may have styled themselves 'cloth-clad' in contradistinction to the skin-wearing neolithic nation that preceded them (see CELTS). Following their invasion in 43 A.D., the Romans held Britain for close on four centuries, though the uplands and highlands to the north of the Humber and to the west of the Severn they never really subdued. In the first years of their occupation the country south of the Solway Firth and the mouth of the Tyne formed one Roman province under a consular legatus and a procurator. Ptolemy mentions seventeen native tribes as inhabiting this tract. Severus (210 A.D.) divided it into two parts, Britannia Inferior, the southern, and Britannia Superior, the northern, placing these under separate prefects. In the division of the empire under Diocletian (292 A.D.) Britain was made a diocese in the prefecture of Gaul, and was governed by a vicarius residing at Eburacum (York). It was divided into five provinces, of which the boundaries, though uncertain, are supposed to have been as follows: Britannia Prima, England south of the Thames and the Bristol Channel; Britannia Secunda, Wales; Flavia Caesariensis, the country between the Thames, Severn, Mersey, and Humber; Maxima Caesariensis, the rest of England to the Wall of Hadrian (q.v.); and Valentia—soon abandoned by the Romans—Scotland south of the Wall of Antoninus (q.v.). While certain districts of Britain were administered by agents of the emperor, more often it was sought (with less success in Britain than in Gaul) to mould to Roman shape existing forms of government. Thus the greater part of Britain was divided up into cantons corresponding to the territories of native tribes, and these were ruled on Roman lines by former tribal chiefs and princes. In the lowland parts of Britain troops were hardly ever seen, but in the highlands of the north and west unruly elements were kept in check by auxiliaries posted locally in *castella*, and by at least three Roman legions—chiefly composed of Gauls, Germans, Iberians, and but few pure Romans—stationed at Eburacum (York), Deva (Chester), and Isca (Caerleon, in South Wales). To facilitate the movement of these troops an elaborate road system, radiating from London, was developed. Of the system, equally important from an economic and from a military point of view, there are still numerous remains. The influence of Roman civilisation in Britain was confined almost solely to the

peaceful areas of the eastern and southern lowlands. There many towns arose, centres of Roman law, and industry, and culture. Fifty-six such towns (*coloniae* and *municipia*) are enumerated by Ptolemy. Of these Eburacum (York) and Verulamium (near St Albans) had the privileges of Roman citizenship. In the rural districts the Roman 'villa' system of land tenure was introduced, and under Roman rule Britain first became a corn-producing country. Over the whole lowland area, town and country, Latin became the common language of the more educated classes of the community. Druidism was the religion of the Britons at the time of their conquest by the Romans, but the latter introduced Christianity and Roman literature into the country, though Christianity was not recognised as the state religion till 324 A.D. There are many remains still extant of the presence of the Romans in Britain, such as camps, roads, ruins of houses, baths, flues, altars, mosaic pavements, painted walls, metallic implements and ornaments, weapons, tools, utensils, pottery, coins, sculptures, bronzes, inscriptions, &c. These remains show that the Romans wished to render their British conquests permanent, and that they had greatly improved the arts of the ancient Britons. In the beginning of the 4th century the skilled artisans and builders of Britain were famous on the Continent. Many of the Roman remains in Britain show that the Romans had introduced into the country the refinements and luxuries of Rome itself. After their departure, however, about 410 A.D., a Celtic revival and an English invasion served very largely to obliterate their influence. See ENGLAND, ROADS, WATLING STREET; Elton's *Origins of English History* (1882), Conybeare's *Roman Britain* (1903), Codrington's *Roman Roads* (1903), and Haverfield's *Romanization of Roman Britain* (1923) and other works.

Britannia Metal, an alloy of 90 parts of tin, 8 antimony, and 2 copper, or of 81 tin, 16 antimony, 1 copper, and 2 zinc. At least most of the alloys passing under this name have between 80 and 90 per cent. of tin with varying proportions of antimony and copper. The manufacture was begun at Sheffield by Hancock and Jessop in 1770; it reached Birmingham towards the close of the century, and made gradual progress. At first, the articles were made by stamping with dies, and soldering up into form; this, being a slow operation, rendered the articles expensive. Afterwards, the curious process of *metal-spinning* was introduced; and this, with the subsidiary operation of swaging, rendered a great reduction in price possible. In the spinning process, a thin sheet or piece of Britannia metal is placed upon a wooden model shaped like the article to be made; the model is made to rotate in a lathe; and steel, hardwood, bloodstone, or other tools are employed to press the yielding metal into all the curvatures of the model. Ductility is an essential quality to the attainment of this end with the metal; how complete it is, may be seen in such articles as Britannia metal teapots and dish-covers, the principal forms of which are not given by hammering, stamping, or casting, but by spinning. Besides spinning and swaging, the processes include stamping, soldering, casting, and polishing. Britannia metal forms a good ground or basis for electroplating with silver. Britannia metal spoons and ladles, made by casting, stamping, and burnishing, have been nearly driven out of the market by German silver; but the former metal is more largely used than ever for hot-water jugs, coffee-pots, sugar-basins, soup tureens, gravy-dishes, vegetable and side dishes, dram bottles, drinking-cups, wine-coolers, soap-boxes, liquor-frames, cruets, waiters, trays, &c.; and as a basis for electroplate. Sheffield and Birmingham are

the chief seats of the manufacture. After electroplating came into general use in the decade 1840-50, the trade in Britannia metal wares became double what it was previously.

Britannia Tubular Bridge. See BRIDGE.

Britannicus, or in full, Claudius Tiberius Britannicus Caesar, was the son of the Emperor Claudius (q.v.) and his wife Messalina, and was born 42 A.D. The second wife of Claudius, Agrippina, caused her husband to adopt her son Nero, and treat Britannicus as an imbecile; and Nero, after his accession to the throne, caused his miserable half-brother to be poisoned in 55.

British Association, an association whose object is, by bringing together men eminent in all the several departments of science, to assist the progress of discovery, and to diffuse over the whole country the latest results of scientific research. A prevailing impression that England had fallen behind other countries, both as to the general estimation in which scientific men were held, and the prosecution of science itself, led to its formation. It was thought that an imposing union of men of science with the nobility, gentry, and clergy might tend to revive the philosophic spirit of the country. Such meetings had already taken place in Germany, and probably suggested the idea of this institution. Many leading men of the age took part in its formation, but the honour of being its founder must be ascribed to Sir David Brewster. By his exertions the first meeting of those who were favourable to the design was held at York in the year 1831. At this meeting the constitution of the society was determined, the several sections had their provinces assigned to them, and subjects were proposed on which reports were to be drawn up and read at the ensuing meeting. This took place at Oxford in 1832. The university had cordially welcomed the new association, the papers read gave it a high character, and from this date it may be said to have been in complete and successful operation.

At the close of each meeting, the town at which the meeting shall be held (usually in the United Kingdom, but now and then in the Dominions) is determined two years in advance, and a president appointed. The subscriptions of a continually increasing membership have placed a fund at the society's disposal, which has been expended in the prosecution of science.

The annual meeting takes place about the end of August and lasts more than a week, excursions and social gatherings diversifying the more serious labours of the association. There are similar American, French (1872), and German associations for the advancement of science. See O. J. R. Howarth, *The British Association: a Retrospect, 1891-1921* (1922).

British Columbia, &c. See COLUMBIA, GUIANA, HONDURAS, &c. For British South, Central, and East Africa, see NYASALAND, MATABELELAND, ZAMBESIA, &c.; and for the British Empire, see GREAT BRITAIN.

British Gum. See DEXTRIN.

British Museum. The British Museum, an important national institution in London, originated in a bequest of Sir Hans Sloane, in accordance with which his extensive collection of objects of natural history, works of art, books and manuscripts, was offered in 1753 to the government for the sum of £20,000, or two-fifths of its original cost. The offer was accepted; the necessary funds were raised by a lottery; and the collection, with the Royal Library and the Harleian and Cottonian MSS., was arranged in Montagu House, which had been purchased for £10,250. The new institution,

thenceforth called the BRITISH MUSEUM, was opened in 1759. The presentation by George III. of a collection of Egyptian antiquities in 1802, the purchase of the Towneley Marbles in 1805, and of the Elgin in 1816, necessitated the erection of a new wing. Soon afterwards the old house was condemned, and plans were prepared by Sir R. Smirke for new buildings; but none were undertaken till 1823, when the eastern wing of the present building was erected for the reception of the library of George III., which had been acquired by the museum from George IV. The building, a hollow square in the Ionic order of architecture, was not completed till 1852. Its principal front is towards the south, facing Great Russell Street, and presenting an imposing columnar façade, 370 feet in length. On each side of the south front there is a semi-detached block, containing the residences of the director and keepers; they will before long be taken into the museum for storage.

Scarcely had Smirke's plans been carried out, when it was found that the increase of the library, both in books and readers, made fresh building imperative. A plan devised by Mr (afterwards Sir Anthony) Panizzi, the keeper of the department of printed books, was accepted. Parliament voted the first grant for it in 1854, and it was executed in three years, at a total cost of £150,000. The new building was erected in the interior quadrangle, which it almost completely occupies. The reading-room is circular, and contains ample and comfortable accommodation for 458 readers. It is constructed principally of iron, with brick arches between the main ribs. The dome is 106 feet in height, and its diameter 140 feet, being second only to the Pantheon of Rome, and that but by 2½ feet. Equally remarkable has been the saving of space in the fitting up of the library. The shelves are formed of galvanised iron plates, and are supported on malleable-iron standards. The bookcases are all double, being divided by a lattice of ironwork. Thus interior walls are dispensed with. In front of the original bookcases movable or 'sliding' cases (an invention of a member of the staff) are now added as need arises. The building is now being raised by a story; it contains, perhaps, 35 miles of book-shelves, holding 2,000,000 volumes, and potentially many more. In addition to this, the domed reading-room has accommodation for 60,000.

With the rapid increase of the collections, both by donation and purchase, the need of space was soon again felt, and the trustees resolved to erect a building to be devoted entirely to Natural History—that is to say, to the departments of Botany, Zoology, Geology, and Mineralogy—on the site occupied by the International Exhibition of 1862. Parliament voted in the year 1873 £80,000 for this purpose, and the new rooms began to be occupied in 1881. The whole cost of the new museum very nearly reached the sum of £400,000. This building, which stands in the Cromwell Road, South Kensington, was designed by Alfred Waterhouse; it is faced within and without with terra-cotta, and is architecturally greatly inferior to the Bloomsbury building. In 1879 the reversion of a bequest by Mr William White enabled the building at Bloomsbury to be enlarged by the addition of the Mausoleum Room on the west side, and on the east, on ground formerly occupied by the principal librarian's garden, of the 'White Wing,' which included a new MSS. Students' Room; these were opened in 1888. The adjoining land on the east, north, and west sides, extending to the street-front, was acquired in 1894 for further extension, which was begun on the north with the 'King Edward VII. Galleries,' partly provided from a bequest by Mr V. Stuckey

Lean; this wing was designed by Sir J. J. Burnet, and opened in 1914. Since 1905 British provincial newspapers have been stored at a repository at Hendon.

Contents.—At first the contents of the museum were arranged under three departments—Printed Books, Manuscripts, and Objects of Natural History. From time to time the number of the departments has been increased, so that, instead of three, there are now twelve—viz. *Bloomsbury*: Printed Books (with printed Music and Maps), Manuscripts, Oriental Printed Books and MSS., Prints and Drawings (with the sub-department of Oriental Prints and Drawings), Oriental Antiquities, Greek and Roman Antiquities, Coins and Medals, British and Mediæval Antiquities, Ceramics and Ethnography; *South Kensington*: Zoology, Entomology, Botany, Geology, and Mineralogy.

Printed Books.—This, the national library, occupies nearly half the building.

The original bequest of Sir Hans Sloane consisted of 50,000 volumes. In 1757 George II. presented the library of printed books which had been collected by the kings of England since Henry VII., and which included the libraries of Cranmer and Casaubon. He also annexed the important privilege, which the Royal Library acquired in 1709, of being supplied with a copy of every publication entered at Stationers' Hall. Among subsequent additions may be mentioned the Thomason collection of English Civil War pamphlets, presented by George III.; Dr C. Burney's Newspapers; Garrick's collection of old English plays; Dr Bentley's collection of the classics, annotated by his own hand; the Rev. C. M. Cracherode's library of about 4500 volumes, remarkable for their beauty and excellence of condition; Sir J. Banks's collection on natural history; and J. W. Croker's collection of French Revolution pamphlets. The library was nearly doubled in size, and more than doubled in value, in 1823, when parliament acquired from George IV. the splendid library collected by his father. The smaller but even choicer library of Thomas Grenville was bequeathed to the museum in 1846. It consists of 20,240 volumes. Whole libraries are now rarely acquired, as they involve the multiplication of duplicate copies. But in 1910 Mr A. H. Huth bequeathed a small but very valuable selection of 50 printed books and MSS. from his famous library, the selection being left to the trustees. A modern extension of the scope of the library has been made by the bequest in 1891 by Thomas Keay-Tapling, M.P., of his Postage Stamps. By purchases, bequests, and donations, largely owing to the energy of Panizzi, the library has become one of the two finest, and in foreign books far the finest, in the world, containing now nearly 4,000,000 printed volumes (see *LIBRARIES*). In 1880–90 the annual increase was between 30,000 and 40,000 volumes. Since 1900 the annual additions from all quarters, exclusive of about 350,000 continuations, music, newspapers, &c., average about 30,000. The works acquired under the Copyright Act are much more numerous, and on the average less valuable, than those purchased or those presented.

A catalogue of the printed books, in seven octavo volumes, was published in 1813–19. So great have been the additions to the collection that in 1880 the general MS. catalogue occupied upwards of 2000 volumes folio. The printed catalogue, begun in 1881 under the care of Dr Richard Garnett, required for its completion at the beginning of the 20th century some 50 folio printed volumes; as now interleaved for accessions these (with the catalogues of maps and music) occupy over 1000 volumes. The adoption of printing also facilitated the commencement of a subject-catalogue of all new acquisitions

by Mr G. K. Fortescue, at first privately, now officially kept up to date. Other important catalogues of special classes and collections have since been published.

The right of access to the library is easily obtained. Any person desiring it is 'to apply in writing, addressed "To the Principal Librarian of the British Museum," specifying his description and place of abode, and accompanying his letter with a written recommendation,' when he will receive a ticket, renewable every six months. After the adoption (1880) of electric light in the reading room the number of readers greatly increased; in 1913 they reached the total of 236,643, in 1920 of 147,145. The number of books consulted by these readers was well over 1,500,000. There are also the Newspaper Room, the Map Room, and the North Library, enlarged in 1914 from the Lean bequest, for rare books, &c., part of the last being used as a Journal Room. There are separate catalogues of *Maps* and *Music*.

Manuscripts.—The manuscripts are contained in several rooms in the south-east angle of the building. The collection consists of: (1) The Sloane, relating chiefly to medical and natural history subjects. (2) The Cotton, rich in documents referring to the history of Britain, including two of the originals of *Magna Carta*, in registers of English monasteries, and in original letters of royal and illustrious personages. This collection contains the *Lindisfarne Gospels*—a copy of the Latin text, written and illuminated about 700 A.D., with a later interlinear Northumbrian gloss. (3) The Harleian, a collection rich in illuminated MSS., in ancient, civil, and ecclesiastical records, in manuscripts of the classics, among which is one of the earliest known copies of the *Odyssey*, and in early English poetry. (4) The manuscripts of the Ancient Royal Library. These were collected by our kings, from Richard II. to George II.; many of them were obtained from the monasteries at the dissolution. Amongst the most valuable treasures here is the *Codex Alexandrinus*, a manuscript of the Bible written in uncial Greek, before the close of the 5th century. (5) The Lansdowne. This collection comprises the Burghley and Cæsar papers, the manuscripts of Bishop Kennett, and numerous valuable historical documents and state papers. (6) The Hargrave, almost exclusively connected with law. (7) The Burney, of Greek and Latin classics. (8) The King's, being those from King George III.'s library (see above, *Printed Books*). (9) The Howard-Arundel, obtained from the Royal Society. This collection is singularly rich in materials for the history of our own country and language. (10) The Egerton, bequeathed by Francis Lord Egerton in 1838, with a fund (augmented by Charles Lord Farnborough) from which it is continually added to. (11) The Stowe, purchased in 1883. (12) Additional, consisting of all miscellaneous acquisitions from the foundation of the museum. Catalogues of the complete collections have long been in existence, while that of the Egerton and additional manuscripts is continually being increased by fresh volumes. Separate catalogues have also been issued of the collections of Greek and Latin MSS., and of romances. The most important recent addition to the department is the gift by the Earl of Chichester of the Duke of Newcastle's papers in 430 volumes. The department now contains about 60,000 volumes, 76,000 charters and rolls, some 17,000 detached seals and casts of seals, and upwards of 1900 ancient Greek, Coptic, and Latin papyri.

Oriental Printed Books and MSS.—Formed from the departments of Printed Books and MSS. Noteworthy are: the collection of Hebrew Bibles; the Near-Eastern MSS., collected by Claudius

Rich (died 1820) while consul at Baghdad; the Syriac MSS. from Nitria; the Ethiopic MSS. acquired after the Abyssinian expedition of 1867; the Chinese library of Robert Morrison (1846); and the Chinese and other Central Asian MSS. recently collected in Turkestan by Sir M. A. Stein.

Prints and Drawings.—This department is housed in the King Edward VII. Galleries; its exhibition gallery and students' room occupy the top floor. Its foundation was in bequests by Cracherode (1799), and Payne Knight (1824); no purchases were made till about 1840. The collection now contains examples in all English and foreign schools of original drawings, etchings, and engravings, also of prints from pictures by well-known masters. There is also an extensive collection of English and foreign portraits and of satirical prints.

Oriental Prints and Drawings (sub-department of).—Formed in 1913, when the Morrison collection of Japanese and Chinese paintings was presented by Sir W. Gwynne-Evans. A large collection of Japanese drawings and woodcuts was already in the department.

Oriental Antiquities.—The Egyptian monuments in this department date from the late pre-dynastic period (about 4500 B.C.), and come down to the 11th century A.D. The collection comprises the antiquities which fell into the hands of the British army at the capitulation of Alexandria; presents from General Vyse, the Duke of Northumberland, &c. The sculptures are formed of granite and basalt; they represent human and allegorical figures, sometimes of colossal size. There are several beautifully sculptured sarcophagi. The key to the Hieroglyphics (q.v.) was furnished by the celebrated Rosetta Stone (q.v.), which is placed at the south end of the gallery. The smaller Egyptian remains are exhibited in a gallery on the upper floor; they consist of objects relating to religion, as representations of divinities and sacred animals in wood, metal, stone, and porcelain; of objects relating to civil and domestic life, as dress, personal ornaments, household furniture, artistic and writing implements, armour, and weapons of war, &c.; and of objects relating to death and burial, as mummies and coffins, with the scarabæi, amulets, and other ornaments found with them.

The Assyrian antiquities mainly consist of sculptures excavated at Nimrud, Khorsabad, and Koyunjik by Layard in 1847-50, and more recently by Rassam and Loftus, under the direction of Sir H. C. Rawlinson. The Nimrud sculptures are the oldest, belonging to a period ranging from 930 to 747 B.C. Those obtained from Khorsabad seem to have been executed under a monarch who reigned about 747-721 B.C., while the collection from Koyunjik belong to the time of Sardanapalus, apparently 721-625 B.C. The monuments consist chiefly of slabs of gypsum, alabaster, and limestone sculptured in low relief, the subjects being the exploits of the king whose palace walls they ornamented.

Other Semitic antiquities are here; also the Hittite remains, with hieroglyphic inscriptions as yet undeciphered, from the site of the ancient Carchemish. Excavation for the museum, suspended there, has been renewed at 'Ur of the Chaldees.'

This department has published not only catalogues and guides, but very many texts of great value; among these may be mentioned the Egyptian *Book of the Dead*, from the *Papyrus of Ani*.

Greek and Roman Antiquities.—This collection occupies a series of rooms extending on both floors from the entrance-hall to the former north-west angle of the museum. The Archaic Room contains remains from ancient cities in Lycia, obtained by Sir C. Fellows in 1842-46; the Ephesus Room,

those of the 'temple of Diana of the Ephesians'; the Elgin Room, Attic sculptures of the 5th century B.C., the greater portion of which were saved from destruction, at a cost of £70,000, by the Earl of Elgin, and purchased from him in 1816 for £35,000. The most important series in this gallery, and the most famous possession of the museum, are the decorations of the Parthenon (q.v.). It contains also sculptures and casts from the Temple of Wingless Victory, the Temple of Theseus, and the Erechtheum, at Athens. In an anteroom is the beautiful Demeter of Cnidos. The Phigaleian Room is named from the Phigaleian frieze; it also contains the 'mourning woman' from Trentham, and a series of Attic sepulchral slabs (stelæ), &c. In the Mausoleum Room are the remains of the famous Mausoleum (q.v.) at Halicarnassus, discovered by Sir C. T. Newton in 1857-59. The Nereid Room contains the sculpture from the 'Nereid' monument at Xanthos in Lycia.

The Græco-Roman sculptures include many from the Towneley collection, such as the well-known Clytie, Venus, and Discobolus, and afford a striking contrast with the true Greek work in the neighbouring rooms. The Hall of Roman Busts contains a fine series of portraits of emperors and others. A basement room is given to Etruscan remains. Of Greek and Roman inscriptions a selection is exhibited.

The collections of smaller remains are on the upper floor. They consist of (1) Greek vases formed from the collections of Sir W. Hamilton, &c., and from excavations on the sites of Greek colonies; the series begins with vases, &c., excavated on sites in Crete by Sir A. Evans, representing the prehistoric Minoan civilisations. (2) A miscellaneous collection of terra-cottas, including the beautiful figurines from Tanagra and other places, mural paintings, and other objects. (3) Bronzes of Greek, Etruscan, and Roman workmanship, consisting of sculptures, and various domestic and other articles, as candelabra, lamps, vases, horse-trappings, armour, &c. (4) The collection of engraved gems and gold ornaments, now, since the addition of the Blacas and Castellani collections, perhaps the richest in the world. (5) Roman mosaic pavements.

Coins and Medals.—The nucleus of the collection was formed by Cotton's and Sloane's and George III.'s cabinets. Among notable sources of later additions have been:—(1) Greek: the Payne Knight bequest (1824), and the Bunbury (1896), Montagu (1896-97), and Weber (1919) sales; (2) Roman: the Cracherode (1799) and Wigan (1864) bequests; (3) English: the Bank of England's collection, presented in 1877; Sir John Evans's, presented by Mr J. Pierpont Morgan, and his early British and Celtic coins, presented in 1919 by Sir A. Evans; this section has also been frequently enriched by the Crown's right to treasure-trove; (4) Oriental: the W. Marsden and the India Office collections, presented in 1834 and 1882, and General Sir Alexander Cunningham's collections, sold on very generous terms in 1888 and 1894. Most valuable for their beauty, as apart from historical interest, are the coins of ancient Greece and the medals and plaquettes of the Italian Renaissance. The department has recently secured adequate space for exhibition in the former Waddesdon Room.

British and Medieval Antiquities.—This is what remains of the old department of antiquities, which originally included the Egyptian, Assyrian, Greek, and Roman Ceramic and Ethnographical collections, and the coins. It still represents most phases of European culture. Canon William Greenwell presented his British Stone and Bronze Age weapons, &c., excavated by himself, and described in his *British Barrows*; his two later and more general

prehistoric collections were (1) presented by Mr J. Pierpont Morgan, and (2) bequeathed (with the donor's other collections) in 1919 by Dr Alan Sturge. The sections of British and mediæval art have been much enriched by the following great bequests: William Burges's of mediæval art (1881), Octavius Morgan's clocks and watches (1888), Baron Ferdinand Rothschild's Waddesdon collection of works of art, chiefly of the Renaissance (1898), Canon Barwell's Limoges and other enamels (1913). In all sections this and the next department are largely indebted to the gifts and bequest of Sir A. W. Franks, keeper from 1866 to 1896.

Ceramics and Ethnography.—Divided from the British and Mediæval Antiquities in 1921. (a) *Ethnography*: Henry Christy, one of the first to perceive that the prehistoric age is illustrated by the weapons, utensils, &c. of peoples now in the same stage of development, made this section (founded on the Cook and Wallis collections) important by his bequest in 1865. The religious art (other than the great monuments) of many countries is here represented, and that of India should not pass unmentioned. (b) *Ceramics and Glass*: Now housed in the King Edward VII. Galleries; chiefly enriched by Felix Slade's glass (1868), John Henderson's Italian majolica, Oriental wares, &c. (1878), and the Franks gifts and bequest. The Chinese porcelain and the Rhodian and English potteries are specially noteworthy.

Natural History Museum at South Kensington.—In 1856 the trustees united the Natural History departments under Professor Owen. In the spring of 1881 the new building at South Kensington was opened. It houses the following departments:—

Zoology.—This department contains a collection of animals arranged in systematic order, comprising stuffed mammals, birds, reptiles, and fishes. A room is specially devoted to the fauna of Britain. Among the very numerous collections that have enriched the department may be mentioned the Wallace birds from the Eastern Archipelago (1873), the Gould humming-birds, the Walsingham birds and nests, and the Selous African animals and birds' eggs (1919).

Entomology.—Separated from Zoology in 1913. The two departments at the removal in 1881 possessed 1,300,000 specimens; in 1922 they possessed over 6,000,000. The annual addition to the entomological collections is about 150,000. The department did much valuable service during the war of 1914–19 in studying the parasites of man. It also conducts a popular campaign on the same subject.

Botany.—The herbaria of Sir Hans Sloane and of Sir Joseph Banks (bequeathed 1820) are the nucleus of the collection; others have been added from time to time. It contains an extraordinary number of typical specimens—the identical plants from which the original descriptions were taken by Linnæus and other famous botanists.

Geology and Palæontology.—This department is especially rich in the fossils of the secondary formations. Amongst its contents may be mentioned the collections of Dr Mantell, the Tertiary fossils collected by Dr Falconer in India, and the fossil birds from New Zealand. Notable recent additions to the series of fossil remains of man are the Pilt-down and Rhodesian skulls.

Mineralogy.—In the mineral gallery is exhibited a selection of specimens, arranged according to a chemical classification.

The museum has always been governed by a body of trustees, of whom there are three principals, the Lord Chancellor, the Archbishop of Canterbury, and the Speaker of the House of Commons.

The usefulness of the museum must always be gauged by the help it renders to real students. Even the art departments at Bloomsbury aim

rather at preserving for comparison and study representative products of different civilisations, than at the direct education of artists, the latter being the object of the Victoria and Albert Museum. Its officers have conducted many archaeological and scientific explorations, by which the collections have been greatly enriched. Of the vast collections in the Natural History departments only a small selection can be exhibited; and the work of the departments lies rather in the classification and private study of the specimens. In all departments the museum's officers are constantly publishing these studies in specialist journals. Every department has published full and scholarly catalogues as well as popular guides; very few, therefore, have been mentioned here. The primary function of the museum, in fact, is to educate the educators, and public exhibition has been a later development. But much of late years has been done to increase its educational value and popularity with casual visitors. Every article exhibited is clearly labelled. In departments, the bulk of whose treasures cannot be displayed, selections are shown. Exhibitions have also been given in the King's Library in celebration of the tercentenaries of Luther, Wyclif, Milton, the Authorised Version of the Bible, &c. At South Kensington the Central Hall is given up to a general introductory exhibition. Official guides conduct popular lecture-tours through both museums daily.

The expenses of the museum are paid by public grants aided by trust funds. The sum provided by the estimates in some years exceeds £200,000. The normal grant for purchase has for many years been fixed at about £6500 per department. As auction prices have long been increasing, it is now very difficult for the museum to secure acquisitions of the first importance in the open market. But by the vigilance of its officers, aided by private benefactors and occasionally by special grants of public money, valuable additions are made and gaps filled year by year in the various departments. The number of visitors to the museum (exclusive of readers in the library) and to the Natural History Museum amounted together in 1913 to a total of 1,433,410, in 1920 to 1,379,184.

Britomartis, or APHAIA. See DICTYNNA; also ÆGINA.

Briton Ferry, a seaport of South Wales, in Glamorganshire, at the mouth of the river Neath, 2½ miles from the busy town of Neath, to which it serves as a port; pop. 9000.

Brittany (Fr. *Bretagne*), the great north-western peninsula of France, extending in triangular form into the sea, its base resting on Normandy, Maine, Anjou, and Poitou, its sides washed by the Channel and the Atlantic Ocean. In earlier times it formed, with the name of duchy, one of the provinces of France; now it forms the five departments of Finistère, Côtes-du-Nord, Morbihan, Ille-et-Vilaine, and Loire-Inférieure, with a total area of 13,130 sq. m., and a population (1921) of 2,837,946. Before the Revolution, this district fell into the nine dioceses of Rennes, Dol, Nantes, St Malo, and St Brieuc, Tréguier, Vannes, Quimper, and St Pol-de-Léon; of which the first five made up one of the two popular divisions, the names of which are still in general use: Upper Brittany (*Haute-Bretagne*); the last four, Lower Brittany (*Basse-Bretagne*). Though the height of its mountains nowhere exceeds 1150 feet, their structure gives to the peninsula a wild and savage aspect. Clay-slate forms the centre of the country, and masses of granite rise in the north and the south. The climate is often foggy, and subject to violent storms of wind. Large tracts of land lie uncultivated; but in the well-watered

valleys vegetation is luxuriant. The peculiar shut-in situation and the characteristics of soil and climate in Brittany, seem to have had a powerful effect on the character of its people. The Breton has generally a tinge of melancholy in his disposition; and often conceals, under a dull and indifferent exterior, a lively imagination and strong feelings. He is passionately attached to his country and his customs, and is strongly averse to change. A bold seaman and steady soldier, he is devoted in his loyalty to time-honoured authority in church and state, and is capable of extraordinary devotion and sacrifice of self for his ideal. His piety is profound, although simple and unaffected; his pride, serious and self-respectful, entirely free from that petty peevishness and uneasy watching for small slights which so often belittle the real dignity of the Celtic nature. The manners of the natives might be called rude but for their simplicity. The percentage of illiterate persons in Morbihan is 50; in Loire-Inférieure, Côtes-du-Nord, and Finistère it sinks to 40; in Ille-et-Vilaine it is as low as 30. Thus book-learning, so far as regards French books, has hardly yet reached more than a half of Brittany, and the Bretons would be ignorant and uncivilised indeed but for a quite extraordinary wealth of traditional song and story, that serves effectively all the purposes of a national culture. Perhaps nowhere in the world has folklore reached such a high development, and this not less in quality than in quantity; for no traditional stories come near the Breton folk-tales, no popular poetry the Breton folk-songs. It must not be forgotten that there has long existed a pretty abundant literature, at least in religious subjects, in the Breton language, and that even in our day many natives are capable of reading this who do not read, and need not even speak, French. No part of Europe contains so many megalithic monuments as Brittany. Within the province are more than six hundred *dolmens*, and more than eight hundred isolated *menhirs*, and these, moreover, the grandest examples in the world. The largest, at Locmariaquer in Morbihan, is 67 feet high and no less than 342 tons in weight. *Cromlechs* also are very common, some of rectangular form. The great *alignments* near Carnac, situated within a few miles of each other, are the most celebrated megalithic monuments in the world.

In ancient times, Brittany, under the name of *Armorica*, was the centre of the confederated Armorican tribes, who were of Celtic origin. Later it was known as *Provincia Lugdunensis Tertia*, but it never was more than nominally under Roman sway. Already entirely liberated in the 4th century, it became divided into several allied republican states, which afterwards passed into petty monarchies. The Franks called its turbulent and warlike population *Breton*; the Latin writers, since the 5th century, *Britanni* and *Brittones*; while the country was called *Britannia Cismarina*, also later *Britannia Minor*, to distinguish it from the island of Britannia across the Channel, and to mark the original identity in the populations of the two. Brittany became subject to the Franks in the reign of Charlemagne, and was handed over by Charles the Simple to the Northmen in the 10th century. After fierce struggles the Bretons at length acknowledged the suzerainty of the Norman dukes. Geoffroi, Count of Rennes, was the first to assume the title of Duke of Bretagne, in 992. The duchy of Brittany was incorporated with France in 1532 by Francis I., to whom it had come by marriage; and subsequently it shared in the general fortunes of the kingdom. Its local *parlement* at Rennes was of course merely its supreme court, which but rarely played a political

rôle. At the outbreak of the Revolution all the towns, and even some of the larger communes as well as the coast villages, embraced the new ideas, but the country-people mostly followed the lead of their curés and landlords, and remained intensely loyal to the ancient royal house. Brittany accordingly became the arena of a long and bloody struggle against dominant republicanism, its Chouans almost rivalling the Vendéans in the heroic stubbornness of their opposition to the Revolution; but it must be remembered that the revolt against the new ideas was at no time general as it was in Vendée. It was still smouldering so late as 1832, when there was an outbreak of popular feeling in favour of the elder Bourbons. Brittany has given many great men to France: Abelard, Duguesclin, the Connétable de Richemont, Jacques Cartier, Michel Colomb, Dom Lobineau, Duclos, Surcouf, Broussais, Laënnec, Jules Dupré, Duguay-Trouin, Kératry, Maupertuis, Chateaubriand, Lamennais, Jules Simon, and Renan, not to mention countless sea men and admirals. See Daru, *Histoire de Bretagne* (3 vols. 1826); Le Saint, *La Bretagne Ancienne et Moderne* (2d ed. Limoges, 1879); Loth, *L'Émigration Bretonne en Armorique* (1883); Joanne, *Bretagne* (1884); books by Baring-Gould (1900), Menpes (1905), Le Braz (trans. 1906), Mrs Bell (1907), Mrs Gostling (1909), and G. W. Edwards (1911).

Language and Literature.—The Breton (*Brezonek*, *Brezounek*; Fr. *Bas Breton*), the ancient language of Brittany, still called sometimes Armorican, to distinguish it from insular Breton, is one of those small Celtic tongues which have continued to be spoken languages down to the present time. It forms, together with Welsh in Wales, the but recently extinct Cornish in Cornwall, and that language known from a number of inscriptions to have been the tongue spoken by the ancient Gauls, the Cymric or southern group of the Celtic languages, in which (as in some Italic dialects) Indo-Germanic *gv* became *p*. It is at the present day spoken chiefly in the department of Finistère and the western parts of Côtes-du-Nord, and in Morbihan, and was still, according to the careful calculations of M. Paul Sébillot (in *La Revue d'Ethnographie* for January 1886), the ordinary language of about 1,322,000 persons, of whom no fewer than 679,700 knew that language alone. The paper referred to contains maps showing village by village the limits of Breton and French. By the close of the century there were about 500,000 persons ignorant of French, Breton remaining the 'vernacula lingua' of almost all the actual Breton country. Breton has four dialects: that of Vannes (*Vannetais*), of Quimper (*Cornouaillais*), of Tréguier (*Trécorrois* or *Trégorois*), and of St Pol-de-Léon (*Léonais*), of which the last is the most important. The dialect of Léon is the purest of the four, although the narrowest in its geographical extent; while the Cornouaillais is the widest, and next to it the Vannetais. These dialects indeed follow very nearly the limits of the ancient dioceses. Breton is most closely allied to Cornish and next to Welsh, but it surpasses both these tongues in the refinement of its grammatical forms and words. Most competent scholars consider it as having been carried across the Channel from England in the settlement made in the 6th century. See Rhys, *Lectures on Welsh Philology* (2d ed. 1879), and Belloguet, *Ethnogénie Gauloise* (4 vols. 1858-75). The greatest service to the grammar and lexicography of the language has been done by Pater Gregoire of Rostrenen, Le Pelletier, and especially Le Gonidec (died 1838). The last wrote the best grammar (Paris, 1807; 3d ed. 1850), as well as an excellent lexicon (Angoulême, 1821; St Brieuc, 2 vols. 1847-50). Many valuable papers on questions of Breton philology have been

contributed to the *Revue Celtique*, which was commenced by H. Gaidoz at Paris in 1870, by Gaidoz, Ad. Pictet, Dr Stokes, Sir John Rhys, D'Arbois de Jubainville, Le Men, Sauv  , Luzel, and other scholars. Breton philology was brilliantly advanced by two scholars, Bretons both by birth and tongue: M. Loth and M. Ernault. At the instigation of M. Loth, and mainly under his editorship, the *Facult   des Lettres* at Rennes has published since 1885 a review, *Les Annales de Bretagne*, devoted in great part to Breton philology. See also Whitley Stokes, *Middle Breton Hours*, with translation and glossary (Calcutta, 1876), and his *Old Breton Glosses* (Calcutta, 1879 and 1880; reprinted by the Philological Society, 1886); J. Loth, *Chrestomathie Bretonne* (1890); dictionaries by Loth and by Ernault; and the *Zeitschrift f  r Celtische Philologie*.

The Breton literature of the earliest period (since the 6th century) is grouped together with the Bardic literature of the British Isles. Many of the oldest and most famous of the bards (as Gwezno, Taliesin, Sulio) belonged perhaps to Brittany, and their strong and spirited poetry, partly of a patriotic and historical, partly an erotic character, may have had no small influence on the work of the French trouv  res of the succeeding centuries. We need only allude to the Arthurian cycle of legend, worked up with such poetic wealth and variety of form by the medieval poets. The chief monuments of old Breton are two miracle-plays, a prayer-book or 'Hours,' a dictionary, and the cartularies of two monasteries. Of the plays, the first is founded on the life of St Nonna or Nonita, and exists in a manuscript ascribed by Zeuss to the 14th century. It was chiefly from this source, together with the two cartularies of the monasteries at Rhedon and Landevin, alluded to above, that Zeuss drew the materials for the Armorican part of his famous *Grammatica Celtica*. It was published in 1837 under the title of *Buhez Santez Nonn*, but a much better edition was given by M. Ernault in vol. viii. of the *Revue Celtique*. The second play, the *Burzud braz Jezuz*, the great miracle or mystery of Jesus, was edited by Hensart de la Villemarqu   in 1865, with a translation. It should, however, be added that this mystery has since been shown to be a translation from the French. As in course of time the French speech and culture spread over the country, and became the more familiar form for literary expression, the Breton struck root all the deeper into the affections of the common people, by becoming the chosen medium alone for the expression of their homely proverb, song, and story. Although it gradually ceased to be used for formal literary composition, Breton continued for centuries to be the medium through which the manuals of piety supplied by the church reached the faithful. The primitive manner of life preserved the conditions necessary not only for the transmission, but the creation of the folk-tale and the ballad, and genuine examples of these have continued to be produced by the free working of the popular imagination almost down to our own time. The extraordinary wealth of Breton popular literature was first revealed to the world, although under a somewhat fictitious garb, by La Villemarqu  . His *Barzaz Breiz* (1839; Englished by Tom Taylor in 1865) professed to be the fruit of many years' collecting in every part of Lower Brittany, but unfortunately it cannot be accepted as a genuine undoctored product of the popular imagination in the proper and scientific sense. It consisted of *gwerziou* (plural of *gwerz*), heroic or mythological ballads, many of which are short, but some have as many as 600 verses; *soniou* (plural of *sonn*, or *s  n*), love and festive songs; and religious poems; and was accompanied with translations and notes, and the original airs noted

in the sixth edition (1867), some of which had, however, been given already in the first edition. Other volumes of poetry in the Breton language were Luzel's *Bepred Breizad* ('always Breton'), consisting of original verse (Morlaix, 1865), and a fine collection under his editorship of genuine *gwerziou* or popular ballads chiefly in the dialect of Tr  guier, *Gwerziou Breiz-Izel* (2 vols. 1874). F. M. Luzel, one of the most intelligent and patriotic representatives of 'Bretagne bretonnante' of recent times, as well as one of the most profoundly learned and scientific folklorists of France, published in 1890 his *Soniou Breiz-Izel*. The legends of Brittany were worked up with fine effect by   mile Souvestre in his *Foyer Breton* (1844), and to their rare literary charm we owe some of the finest passages in the pages of George Sand and Renan. Since the 16th century, as has already been said, the native clergy have used the Breton speech for the composition of religious plays and hymns, as well as sermons and books of edification and instruction. At the present day there still appear almanacs in Breton, some bi-lingual; while at election-times there is a plentiful crop of Breton placards and posters. The weekly journal *Feiz ha Breiz* ('Faith and Brittany'), which had a predominantly religious character, died at Quimper after nineteen years' existence (26th April 1884); but other periodicals have followed, wholly or partly in Breton. The language has now a considerable body of modern literature, largely lyric and dramatic. There waited in Upper Brittany an ample harvest of folklore, no less than song and story, for the most learned and indefatigable of its editors, M. Paul S  billot, the chief of whose collections are his *Contes Populaires de la Haute-Bretagne* (three series, 1880-82), *Litt  rature Orale de la Haute-Bretagne* (1881), *Traditions et Superstitions de la Haute-Bretagne* (2 vols. 1882), *Contes de Terre et de Mer, L  gendes de la Haute-Bretagne* (1885), and *Contumes Populaires de la Haute-Bretagne* (1886). And from La Villemarqu  's own ground, Lower Brittany, M. Luzel gave the world the rich gleanings of years in *L  gendes Ch  r  tiennes de la Basse-Bretagne* (2 vols. 1881) and *Contes Populaires de la Basse-Bretagne* (3 vols. 1887), collections that have a place on the shelves of all folklorists. Loth's *Chrestomathie Bretonne* appeared in 1890. There is also a good collection of Breton proverbs, 'Lavarou-Koz,' by L. F. Sauv   (1878). See Henri Gaidoz on 'La Po  sie Bretonne pendant la guerre de 1870-71,' in the *Revue des Deux Mondes* for December 15, 1871; and for other books and papers, the 'Bibliographie des Traditions et de la Litt  rature Populaire de la Bretagne,' by H. Gaidoz and Paul S  billot, in vol. v. of the *Revue Celtique*.

Brittle-stars (Ophiuroidea), one of the classes of Echinodermata, including forms not far removed from starfishes (Asteroids), but differing markedly in the more centralised body, more sharply defined arms, and more active habit. Compared more fully with starfishes, the brittle-stars are more muscular and less limy; the arms do not contain digestive c  ca from the gut nor reproductive organs, and are supported by an axis of central limy bodies like vertebra  ; the tube-feet are smaller, and often of little use in locomotion, which is largely effected by wriggling the arms; the ventral (ambulacral) groove is closed in by limy plates; the alimentary canal is blind—that is, without anus; the entrances to the water-vascular system (madreporic plates) are ventral; and the larval form is quite different. The popular name 'brittle-star' refers to the extreme ease with which the arms break; another common name, 'sand-stars,' refers less happily to their occasional occurrence on the shore; the technical title Ophiuroid describes the snake-like coils of their 'arms.' The commonest British species are

the Common Sand-star (*Ophiura texturata*), the Lesser Sand-star (*O. albida*), and the Common Brittle-star (*Ophiocoma rosula*). Another important genus is Euryale, to which the Basket-fish or Argus Starfish belongs. See ECHINODERMS, STARFISH.

Britton, JOHN (1771-1857), topographer and antiquary, born near Chippenham, received but a scanty education. At sixteen he went to London, and was in turn cellarman, clerk, and compiler of a song-book. Some contributions to a dramatic miscellany led the publisher to employ him, with a young friend, Brayley, to compile the *Beauties of Wiltshire*; its success led up to the *Beauties of England and Wales* (partly by others). They also prepared the *Beauties of Bedfordshire* in the same manner. Britton afterwards issued a more elaborate work, entitled the *Architectural Antiquities of England*. One of the most important of his publications was *The Cathedral Antiquities of England* (1814-35). Altogether his illustrated works number eighty-seven, besides others of a similar kind which he edited. Britton was amongst the first to combine and popularise antiquarian and topographical description, and by his letter to Joseph Hume in 1840 on the preservation of ancient monuments, he anticipated the Act of 1882. See his *Autobiography* (1850).

Britton, THOMAS (1654?-1714), 'the musical small-coal man,' had over his small-coal shop in Clerkenwell a musical club at which Handel and other distinguished musicians performed. He was also an amateur chemist, student of occult literature, and bibliophil.

Brive-la-Gaillarde, a town in the French department of Corrèze, 55 miles SSE. of Limoges by rail; pop. 15,000.

Brixen, a town of Tyrol (ceded to Italy 1919), on the Brenner Railway, 57 miles SSE. of Munich. It is the seat of a bishop, and has several monasteries and a theological seminary. Pop. 6000.

Brixham, a seaport and urban district of Devonshire, England, on Tor Bay, 25 miles S. of Exeter (32½ by rail). It is an irregular place, sprinkled over three valleys and four hillsides; picturesque, though possessed of no architectural features, and fishy as even few fishing-towns. Great quantities of fresh fish are sent to London, Bath, and Bristol; several vessels are engaged in the foreign and coasting trade; there is a little shipbuilding; and the place is a favourite sea-bathing resort. There are iron-mines, limestone quarries, mineral-paint works, and a bone cave on Windmill Hill, discovered in 1858, which contained bones of the mammoth, rhinoceros, horse, reindeer, hyena, bear, &c., besides palæolithic flint implements (see CAVE). Kent's Cavern (q.v.) is beyond Torquay (q.v.), at the other end of the bay. At Berry Head is a Roman camp. At Brixham William of Orange landed, 4th November 1688. Pop. 8000.

Brixton is a district of London (SW.), in Lambeth borough.

Briza, or QUAKING GRASS. See GRASSES.

Brno. See BRÜNN.

Broach, BAROACH, or BHARUCH, a town of Guzerat, Bombay Presidency, 228 miles N. of Bombay by rail, on the north bank of the Nerbudda, from whose inundations it is protected by a river-wall, 30 to 40 feet high, built of large blocks of stone. Eighteen hundred years ago Broach was one of the chief ports of western India, and its foreign commerce did not absolutely disappear until the end of the 18th century. In the 16th century the Portuguese reported it a town of

weavers, 'who make the finest cloth in the world'; this fame led to the founding of English and Dutch factories here in the following century, and even yet its hand-loom weaving is of importance. Broach was taken by the British in 1772, ceded to Sindhia in 1783, and again stormed by a British force in 1803, since which date it has remained a British possession. It carries on a small coasting trade, the principal exports being raw cotton, grain, and seeds. There is a Hindu hospital for old and sick animals. Broach passed from the Moguls at the death of Aurungzebe to the Mahrattas. Pop. 43,400, including many Parsees and Jains.—The district of Broach, an alluvial plain sloping westwards to the shores of the Gulf of Cambay, has an area of 1453 sq. m. It suffered greatly from the famine of 1899-1900. The black soil of the district is highly fertile. There is a railway bridge of 67 spans over the Nerbudda, with a length of 4122 feet.

Broad Arrow, a government mark, thus, stamped, cut, or otherwise fixed on all solid materials used in his Majesty's ships or dockyards, and on government stores of all kinds, in order to prevent larceny. The origin of the mark is obscure; Walford (*History of Newcastle*, vol. iii. 1884) says it was used in 1598 by the collector of customs in Newcastle as a mark for goods seized. The Act of 1698 enacted that persons in possession of naval stores, or goods of any kind marked with the broad arrow, or other marks therein mentioned, and usually employed in marking naval stores, shall forfeit all such goods and £200, and also pay costs.

Broad-bill. See SHOVELLER.

Broad-bottom Administration, a name derisively applied to Henry Pelham's ministry as rearranged in 1744, as including all parties of weight and influence in the state in a grand coalition, and comprising no less than nine dukes. Thus for a time the Whig party were reunited, and even Tory support secured. The ministry was dissolved in 1754 by the death of Pelham, though several of its original members had succeeded long before.

Broad Church. See ENGLAND (CHURCH OF).

Broadhurst, HENRY (1840-1911), born at Littlemore, Oxford, from being a stone-mason became a Labour leader and (1880-92) Liberal M.P. He sat for Leicester in 1894-1906, served on royal commissions, and in 1886 was Under-secretary of State for the Home Department. See his *Autobiography* (1901).

Broad Law, a hill (2734 feet) on the Peebles-Selkirk border.

Broadmoor, in SE. Berkshire, 2 miles from Wellington College Station, is the state asylum (1863) for criminal lunatics.

Broad Peak, a summit of the Karakoram (27,133 feet).

Broads, THE NORFOLK, are a series of inland lakes said to be formed by the widening or 'broadening' out of the rivers. More probably their origin is due to the closing of the ancient estuaries into lagoons, the sand-banks developing into firm land; for even within historic times the river Yare was an estuary of the sea, in which herrings were caught at the time of Domesday. The broads *par excellence* are those up the Bure or North River (which empties itself into the sea at Yarmouth), and its tributaries the Ant and the Thurne. On the Bure leaving the comparatively hilly land north of Wroxham it enters a flat marshy country very little above high-water mark, and right and left of it are the well-known broads of Wroxham, Salhouse, Hoveton, Horning, and Ranworth, all of which can be seen from the main river, and are

approached from it by more or less narrow waterways or cuts. The first (Wroxham) is the largest and deepest, there being sailing-water for large boats all over it; but others are very shallow, and are fast dwindling by natural processes: a fine deposit of mud brought down by the rivers, and the decay of abundant vegetation on the banks. On the Ant there is the fine broad at Barton and another at Sutton; but the latter is fast closing up, and is covered with water-lilies. Up the Thurne there is a very large broad at Hickling, and two others at Martham and Horsey, and these are all of note in the east part of the county, on which it is possible to sail; for the three fine broads of Ormesby, Rollesby, and Filby, though connected and forming a chain, have no practicable outlet to the river. The Yare or Norwich River has no broads on which sailing is possible, but the visitor at Norwich will find those at Surlingham and Rockland well worthy a visit, and very accessible by rail. Near Lowestoft, on the Waveney, is Oulton Broad, but this is near the town, and possesses few of the charms of the other sheets of water named. The broads have grown greatly in favour with holiday-makers. About 1870 it was possible to sail from end to end of the Bure without meeting more than two or three yachts. It would now be hard any fine Saturday in August and September to find a mooring-place by Wroxham Bridge, where perhaps a hundred yachts may be seen at once, the place resembling Henley at a regatta time. The great influx of visitors has destroyed the extreme quiet which was the great charm of the place. Still the strange scenery—the great expanse of the landscape, the rank profusion of vegetation and flowers, and the lofty reed bushes—will always render the spot a pleasant one. The Broad provides a large harvest of reeds used for various purposes, and bulrushes for bottoming chairs, &c. Game and fish abound, but are jealously preserved, and though plover, moorhen, and an occasional duck and heron can be shot from the deck of a yacht, the sportsman is liable to heavy fines if he lands on the bank to pick up what he has shot. Still the occasional visitor is not generally interfered with if he leaves the game alone. Fish, and especially pike, perch, bream, and rudd, are very plentiful still; but there are only the rivers and one or two broads free to all, though permission is generally easily obtained. For the coarse fish it is absolutely necessary to ground-bait liberally in order to bring the fish to the spot. The ruins of St Benet's Abbey, of Burgh Castle (Roman), and many interesting churches are within easy reach.

See G. C. Davies, *Norfolk Broads* (1884); W. Rye, *Month on the Norfolk Broads* (1887); Emerson and Goodall, *Life and Landscape on the Norfolk Broads* (1887); P. H. Emerson, *On English Lagoons* (1893), and *Birds, Beasts, and Fishes of the Norfolk Broadland* (1895); A. B. Dodd, *On the Broads* (1896); H. R. de Salis, *Norfolk Waterways* (1900); N. Everitt, *Broadland Sport* (1902); W. A. Dutt, *Norfolk Broads* (1903); O. G. Ready, *Life and Sport on the Norfolk Broads* (1910); and G. A. Stephen, *Books on the Broads: a Bibliography* (1921).

Broadside, the simultaneous discharge of all the guns on one side of a ship of war. The fighting power of a ship used to be estimated by the weight of all the shot and shell that could be fired off at once from one side or half of the ship. Thus, the broadside of the old-fashioned *Duke of Wellington*, 131-gun war-steamer, amounted to 2400 lb. With modern battleships and cruisers the term is inapplicable; see NAVY.—A broadside or broadsheet is also a large page printed on one side only, containing a ballad, proclamation, dying speech, or other popular matter. See CHAP-BOOKS.

Broadstairs, a watering-place and urban

district in Kent, 1½ miles N.E. of Ramsgate. Near it is a noble orphanage, founded by the wife of Archbishop Tait. Dickens was a frequent visitor. Pop. 15,000.

Broadsword, a sword with a broad blade, usually for cutting only, not stabbing. See CLAYMORE.

Broadwood, JOHN (1732–1812), founder, with the Swiss Burkhardt Tschudi, of the great London pianoforte house, was born at Cockburnspath, Berwickshire, and walked up to London to become a cabinet-maker there.—His grandson, HENRY FOWLER BROADWOOD (1811–93), was likewise a great improver of the piano.

Broca, PAUL, a distinguished French surgeon and anthropologist, was born at Sainte-Foy-le-Grande, Gironde, in 1824. After pursuing his medical studies with distinction, he was named professor of Surgical Pathology in the Faculty of Medicine at Paris, and surgeon successively of the four hospitals of Bicêtre, the Salpêtrière, Saint Antoine, and La Pitié. He was also director of the Laboratory of Anthropology in the High School of Paris. Celebrated not only as a surgeon, Broca was regarded as one of the most learned masters of the existing school of anthropology. He founded the Paris Anthropological Society, of which he was secretary till his death, and he was a member of all the leading medical, biological, and anatomical societies of Paris and the Continent. Elected a member of the Academy of Medicine in 1866, he was decorated with the Legion of Honour in 1868. Broca was a voluminous writer, and among his more important works may be cited the following: *Des Anévrismes et de leur Traitement* (1856), *Sur l'Anesthésie Chirurgicale Hypnotique* (1859), *Études sur les Animaux Ressuscités* (1860), *Instructions Générales pour les Recherches Anthropologiques* (1865), *Traité des Tumeurs* (1865), *Caractère Physique de l'Homme Préhistorique* (1868), and *L'Anatomie Comparée de l'Homme et des Primates* (1869). He also collaborated in the production of several important medical and physiological works. In 1878 he presided over an International Congress on Anthropology held in Paris. He died July 9, 1880.

Brocade (Span. *brocado*). This term is applied to a kind of figured silk resembling on the one hand a damask, and on the other a piece of embroidery. To some extent it partakes of the character of both, but a piece of silk, woven on the old hand-loom with a slightly raised pattern somewhat resembling a piece of embroidered work, was called a brocade. The name is now applied to a figured silk with a satin or cord ground in which several colours are used, and in which a coloured thread (or more than one) is put in by a shuttle only travelling a short distance, or just the width of a flower or figure. This part of the pattern is technically said to be 'brocaded in.' A brocade may only be of silk on the face, and the back of some other material. Johnson defined the term as meaning 'a silken stuff variegated with gold or silver, and raised and enriched with flowers and various sorts of figures, originally made by the Chinese.' With the exception of those woven in modern times, brocades are very generally composed in part of gold, silver, or gilt silver threads.

Oriental brocades date from a remote period, but there were probably no European stuffs of this nature earlier than the 13th or 14th century, when they were made in Italy and Spain. In common with damasks, figured tissues, and other varieties of ornamented silks made in past times, Italian and Spanish brocades, dating from the 14th to the 17th century, as well as those of Persia and Asia Minor, extending over a longer period of time, are extremely valuable objects of study for the textile designer and decorative artist. Their richness,

beauty, and variety of pattern are very great. The French brocades of the 18th century, and even some of quite modern date, are also interesting in an artistic sense. Fine examples of all these are to be found in some continental museums. The collection at South Kensington is very rich, and is being made available to persons at a distance by highly finished chromo-lithographs of the best pieces, already partly published under the supervision of the authorities of that institution. Some interesting specimens of these fabrics can also be seen in the museums of Manchester, Edinburgh, and Dublin.

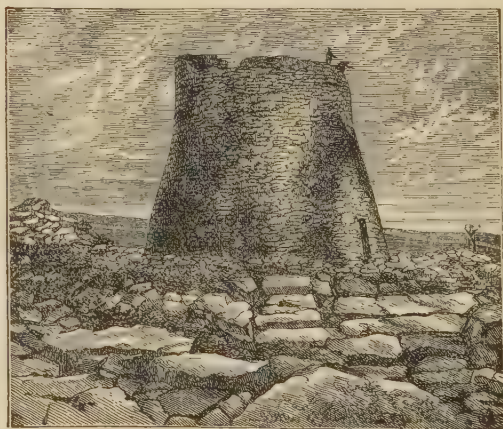
Brocade Bonds, or bonds securing a reward for the promotion of a marriage by influence to be used, are void by the law of England and of Scotland.

Broccoli, a well-known and much-esteemed garden vegetable, one of the many varieties which cultivation has produced of the *Brassica oleracea*, the common kale or cabbage. Broccoli is said to have been originally brought to Italy from Cyprus about the middle of the 16th century. Its name is Italian. It is merely a variety of the Cauliflower (q.v.), with the same general characteristics, but a harder constitution, which enables it to withstand all but our severest winters. Many improved sub-varieties have been introduced within the past fifteen or twenty years, with greater delicacy of flavour and purity of colour, while the original hardy constitution of the race has remained unimpaired. Some of the varieties are early in coming into use from the time of sowing, and others late, and by a judicious selection and a careful study of the times at which each should be sown, broccoli may be made to span the period when cauliflower ceases, in October or November, till it may again be had in June. The trade in broccoli during winter and spring is very great. All British markets are supplied chiefly from Penzance in the early months of the year, the winter climate there being particularly favourable to its early production. The market-gardeners around Edinburgh are noted for the high excellence of the broccoli they produce in the later spring months, and are able to keep up the supply after that of the southern growers fails, and till the first crops of cauliflower come in. See BRASSICA.

The seeds are sown in the open ground in April and May, thinly, and in rows about six inches apart, so that the plants may not become crowded while they remain in the seed-bed. Deep rich loam is requisite to produce the best quality. The plants are finally planted out in June and July, at distances of from two to three feet apart, according to the vigour and bulk eventually attained by the individual sorts. Frequent stirring with the hoe or the fork between the plants is conducive to vigorous growth. In severe winters it is necessary to protect the plants by some means from frost. The most usual means practised is that of digging the soil away from the northern side of each plant, and laying the latter with an angle towards the north. The overhanging leaves prevent the lodgment of rain and snow in the hearts, and offer some protection also against frost, but the size of the heads is usually somewhat diminished by the check administered to the growth. When only small quantities are grown, they may be effectually protected by spreading litter over them when frost is severe, but in the case of large quantities this would prove too laborious and costly. The heads should be cut while they are still quite compact, as otherwise their value is depreciated.

Brochs, the local name applied in the north of Scotland to the ancient, dry-built, circular castles, known also to the Gaelic-speaking people as *duns*,

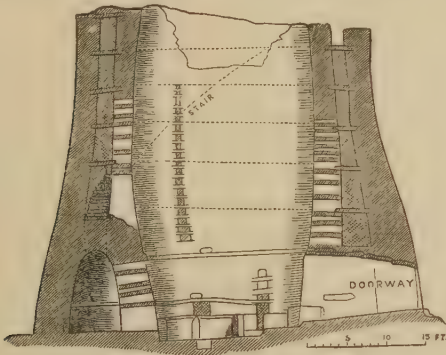
and to antiquaries (since Pennant's time) as 'Pictish towers,' of which Mousa and Clickemim in Shetland, Dun Dornadilla in Sutherland, Dun Carloway in Lewis, and the two in Glenbeg of Glenelg (called Castle Tellve and Castle Troddan by Gordon) are the best-known examples. These circular castles appear to have been more thickly planted along the straths of the northern counties, and around the shores and in the lochs of the northern and western isles, than the later *peels* in the Border valleys. The sites or ruins of more than two hundred are known in the three northern counties. They occur also in very considerable numbers in Ross, Inverness, and Argyll, and a few examples are known in the counties of Perth, Forfar, Stirling, and Berwick. It is only in recent years that the structural characteristics of the brochs and their relation to the other antiquities of the country have been disclosed, chiefly by means of an extensive series of excavations made at the instance of the Society of Antiquaries of Scotland, the details of which, with plans, sections, and measurements of many of these singular edifices, are published in their *Transactions*. The general conclusion is that these structures, which are peculiar to Scotland, belong to a period subsequent to the colonisation of Britain by the Romans, and continued in use, at least in the more northern districts, till after the close of the Viking period of the Northmen, or approximately from about the 6th to about the 12th century. The typical broch, of which Mousa, situated on a small islet near Lerwick, in Shetland, is the best preserved



Broch of Mousa.

example, is a circular tower, built without mortar, the wall 15 feet thick, inclosing a circular area or court 30 feet in diameter. The exterior face of the wall has a slight batter or set inwards; the interior face is perpendicular, but has a ledge or set backwards, at a height of about 8 to 10 feet. There is no opening to the exterior except the door, which is always on the ground-level, and usually about 6 feet in height by about 30 to 36 inches wide. This doorway, or tunnel-like passage, into the interior court through the thickness of the wall, is provided with checks or rebates for a door, with holes in the wall behind them for a long horizontal sliding bar, and these are always placed at some distance within the passage-way, which is further defended by a guard-chamber opening in the thickness of the wall on one or both sides. Round the inside of the court, on the ground-floor, there are, in some cases, doors placed at intervals opening into chambers with beehive roofs, formed in the thick-

ness of the wall. In other cases the wall is solid, except on the left of the main entrance, where there is one opening or doorway, which gives access from the court to a stair in the thickness of the wall leading to the upper stories. Above the first 8 or 10 feet of its height the whole wall is divided, and carried up with a space of about 3 feet between its outer and inner sections, which is traversed horizontally by floors of flagstones at vertical intervals of little more than a man's height. These flagstones are securely bonded into both walls, and each horizontal series passing all round the building forms a floor to the vacant space or gallery above it, and a roof to the gallery below. The stair either crosses all the galleries at one slope, or goes from one to the next by making the floor of each gallery a longer or shorter landing to the next flight of steps. The galleries are



Section of Broch of Mousa.

lighted from the court or inner area of the tower, which is open to the sky. The windows are placed in perpendicular rows, separated from each other only by the thickness of the flagstone which forms the top of one window and the sole of the next above it. No broch being now complete in its upper parts, it is not known what may have been the original height, or the actual number of superposed galleries. Mousa is still 40 feet high, and shows six galleries, and Dun Carloway, which is still 34 feet high, shows five galleries. The brochs vary considerably in size on the ground-plan, the largest known being 70 feet in diameter, and the smallest 40 feet. The average of thirty-one examples is: Exterior diameter, 55½ feet; inner area or court, 28½ feet; thickness of wall, 13½ feet. Many of them have wells within the court, or near the exterior, in which case there is usually a covered way leading to them. Some have drains passing out of the court under the wall. Some are defended by outworks, others completely surrounded by ditch and rampart. In many cases they are placed on promontories cut off from the land by a ditch, or defended by ramparts, while in other cases they are built on islets in lochs, with a causeway of stepping-stones to give access to the islet. At Clickemin there is a gatehouse with guard-chambers at the end of the causeway. But their most remarkable feature is the persistent uniformity of plan and construction which characterises the whole, though with such diversity of detail that no two are exactly alike. Their purpose appears to have been to provide places of secure refuge for the agricultural population, to which they might have recourse with their goods and cattle while the danger of plunder and murder by marauding bands was imminent. The brochs could only be reduced by investment, and as the

marauders' object was to scour the country quickly and get away with their plunder, they could not stay to besiege such strongholds. It is on record that Mousa was once besieged by Harold, Earl of Orkney, about 1155 A.D., but the earl failed to take it, because 'it was difficult to take by assault, and the besieged had made great preparations' to enable them to hold out. The affinities of the typical structure, however, are so distinctively Celtic that none of its essential features have been observed in any construction outside of the Celtic area. The general character of the relics obtained from the systematic excavation of the brochs (of which a collection of some thousands is deposited in the Scottish National Museum) is also clearly Celtic, and of post-Roman times. They show that the occupants cultivated grain, kept flocks and herds, and hunted the forests and fished the seas for their sustenance, that their tools and weapons were swords, spears, daggers, axes, knives, and chisels of iron, and their ornaments, rings, bracelets, pins, and brooches of brass and silver. They made these implements and ornaments themselves, as the moulds, crucibles, and cakes of rough metal found in different brochs testify. Of the bones and horns of animals they made pins, needles, bodkins, buttons, combs, spindle-whorls, and playing-dice, and many other furnishings of everyday life and industry. They made beads and bracelets of jet or lignite, and they had finer beads of variously coloured vitreous pastes, enamelled on the surface with spiral and other patterns. They also made beads and discs of highly polished stone, such as serpentine, marble, and mica-schist. From the commoner varieties of stone they made querns or hand-millstones, mortars, pestles, hammer-stones, whetstones, bowls, cups with handles, lamps, and culinary vessels of various kinds. Their pottery was often fine in shape and finely ornamented. They practised spinning and weaving to a large extent, eighteen weaving-combs and thirty spindle-whorls having been found in a single broch.

See Gordon's *Itinerarium Septentrionale* (1720); Pennant's *Tour in Scotland* (1769-72); Low's *Tour through Orkney and Shetland in 1774* (Kirkwall, 1879); Pococke's *Tours in Scotland, 1747-60* (Scottish History Society, 1887); *Archæologia Scotica*, vol. v.; Erskine Beveridge's *Coll and Tiree* (1903), and *North Uist* (1911); *Proc. Soc. Antiq. Scot.*, vols. xxxv., xxxvi., xlviii.; Dr Joseph Anderson's *Scotland in Pagan Times* (1883); and the Reports (1911) of the Royal Commission on the Antiquities of Sutherland, in which county remains of 67 brochs are noted; and of Caithness, which has 145.

Brock, SIR ISAAC (1769-1812), general, born in Guernsey, served in the 8th (King's) Regiment and in the 49th Foot, in which he raised a company. He was rapidly promoted, took part in the North Holland and Baltic operations, and went to Canada in 1802. He commanded in Quebec and (1810) Upper Canada, received the surrender of the Americans at Detroit, and was killed in battle at Queenston. See *Life* by Lady Edgar (1906).

Brock, SIR THOMAS (1847-1922), sculptor, born at Worcester, studied in London with J. H. Foley and in the Royal Academy School. He was admitted A.R.A. in 1883, R.A. in 1891. Apart from works in galleries, a great many of his public statues and monuments are well known, as the Queen Victoria Memorial at Buckingham Palace, and the Black Prince at Leeds.

Brocken (*Mons Bructerus* of the Romans), popularly known as the *Blocksberg*, the highest summit of the Harz Mountains, is situated in Prussian Saxony, 20 miles WSW. of Halberstadt, and 3740 feet above the sea. There pagan worship lingered long after the introduction of Christianity, and there the superstition of the 16th century annually assembled the witches on Walpurgis

Night (see WALPURGA) to hold their revels on its summit. The mountain is also interesting for the 'Spectre of the Brocken' (see MIRAGE).

Brockhaus, FRIEDRICH ARNOLD, the founder of the well-known firm of Brockhaus in Leipzig, and publisher of the *Conversations-Lexikon*, was born at Dortmund, 4th May 1772. In 1802 circumstances led him to Holland, but he returned to Germany in 1810, and in the following year commenced business in Altenburg. Before this, however (in 1808), he had purchased the copyright of the *Conversations-Lexikon*, which had been begun by Löbel in 1796, and was completed in 1811. In 1812 an improved edition began, with Brockhaus as editor. In 1817 his business had so increased that he found it necessary to leave Altenburg for Leipzig, where, in the following year, he added book-printing to publishing. Through all his publishing enterprises, a zealous devotion to the cause of liberty and general enlightenment may be traced. He died 20th August 1823. See his *Life and Letters* (3 vols. 1872-81). The business was afterwards carried on by his sons Friedrich (1800-65) and Heinrich (1804-74); from 1850 by the latter alone; later by Heinrich-Eduard (1829-1914) and Heinrich-Rudolf, his sons, who retired in 1895. Their sons Albert-Eduard (died 1921) and Rudolf-Heinrich had joined the firm; and in 1905 Albert's son Fritz succeeded Rudolf. The *Conversations-Lexikon* has continued to be a conspicuous success; its 14th ed. (for the first time illustrated), in 16 vols., was published in 1892-97; a new edition was begun in 1902. There have been several editions of an abridgment in two or three volumes. Another publication issued by the house (since 1831) is the monumental *Allgemeine Encyclopädie der Wissenschaften und Künste* of Ersch and Gruber, begun in 1818, and still unfinished (168 vols.).

HERMANN BROCKHAUS, third son of F. A. Brockhaus, was born at Amsterdam, 28th January 1806; studied at Leipzig, Göttingen, and Bonn; and lived successively in Copenhagen, Paris, London, and Oxford. From 1848 till his death he held at Leipzig the chair of Sanskrit. His works include editions of the *Fables of Somadeva*, *Kathā Sarit Sāgara* (1839-66); of the Persian version of the 'Seven Wise Masters' (1845); and of the 'Songs of Hafiz' (1854-60). He died at Leipzig, 5th January 1877.

Brockram (signifying 'broken rock') is the local name given to the breccias of Lower Permian age which occur in the north of England, or near Appleby and Kirkby-Stephen. These breccias consist largely of fragments of limestone set in a red sandy matrix, and are occasionally quarried for limestone and building-stone.

Brockton, formerly called North Bridgewater, is a city of Massachusetts, 20 miles S. of Boston. It manufactures boots. Pop. 66,000.

Brockville, a town of Ontario, on the left bank of the St Lawrence, 125 miles SW. of Montreal. It is on the Grand Trunk Railway, and is a port of call for steamers on the St Lawrence. It took its name from Sir Isaac Brock (q.v.). Pop. 10,000.

Brodie, SIR BENJAMIN COLLINS, surgeon, was born at Winterslow Rectory, Wiltshire, in 1783. He studied under Sir Everard Home at St George's Hospital, to which he was in 1808 elected assistant-surgeon, and afterwards surgeon. He had previously lectured both on anatomy and on surgery. In 1810 he was elected a Fellow of the Royal Society, and in 1811 received their Copley medal. In 1834 he was created a baronet, and he held the appointment of serjeant-surgeon to Queen Victoria. He was president of the Royal Society. He wrote on nervous affections, on medical studies,

on psychology, and an *Autobiography*, and died 21st October 1862.—His son, SIR BENJAMIN COLLINS BRODIE (1817-1880), professor of Chemistry at Oxford, discovered graphitic acid.

Brodie, WILLIAM, son of Convener Francis Brodie, was a wright and cabinetmaker, a deacon councillor in Edinburgh. In 1786 he became leader of a gang of burglars, and among other enterprises robbed the Excise Office. One of the gang informed; Brodie was captured at Amsterdam, and hanged (1788). See Stevenson and Henley's play, *Deacon Brodie*, and a book by W. Roughhead (1907).

Brody, a town of Eastern Galicia, is situated on a swampy plain, surrounded by forests, 89 miles ENE. of Lemberg by rail. Leather and flax manufactures, brewing, refining, and fur-dressing are carried on. The trade is almost entirely in the hands of the Jews, who form three-fourths of the inhabitants, so that Brody has been called the 'German Jerusalem.' Pop. 20,000.

Broek, long famed as 'the cleanest place in the world,' is a village 6 miles NE. of Amsterdam, with a great dairy farm.

Brogie, a prominent French family, of Piedmontese origin; its most important members have been the four dukes of the name: (1) FRANÇOIS MARIE, first Duc de, marshal of France, born 1671, took part in every campaign from 1689, and died in 1745.—(2) VICTOR FRANÇOIS, his son, born 1718, was the most capable of the French commanders in the Seven Years' War. Made a marshal in 1759, he entered the Russian service after the Revolution, and died in 1804.—(3) ACHILLE CHARLES LÉONCE VICTOR, grandson of the last, and son of Prince Claude Victor (born 1757, guillotined 1794), born in 1785, was distinguished as a Liberal politician and an earnest advocate for the abolition of slavery. He was foreign secretary (1832-34) and prime-minister (1835-36) under Louis-Philippe; after 1851 he lived in retirement, and died in Paris, 25th January 1870. He was a member of the Academy, and published *Écrits et Discours* (3 vols. 1863), whilst the fourth and last volume of his *Souvenirs* appeared in 1887.—(4) JACQUES VICTOR ALBERT, his eldest son, born 13th June 1821, early entered the field of literature, and was elected an Academician in 1862. Returned as a deputy in 1871, he was till May 1872 ambassador at London; he then became leader of the Conservative right centre, and with a view to force a monarchical government on France, he brought about the resignation of Thiers, and the election of MacMahon, in 1873. He was twice premier (1873-74, 1877), resignation being on both occasions forced on him by Gambetta's exposure of his reactionary tactics. His most important works are his orthodox *L'Eglise et L'Empire Romain au IV^e Siècle* (6 vols. 1856-69), *Le Secret du Roi* (3d ed. 2 vols. 1879), two hostile works on Frederick the Great (1882 and 1884), and the *Mémoires de Talleyrand* (1891). He died 19th January 1901.

Brogue (Irish and Gaelic *brog*), a light shoe formed of one piece of hide or half-tanned leather, gathered round the ankle, which was formerly much in use among the native Irish and the Scottish Highlanders, and of which there were different varieties.—The term brogue is also used to signify the peculiar pronunciation of English that distinguishes natives of Ireland.

Broiling is a convenient and expeditious mode of cooking small pieces of meat, by laying them on a gridiron over a bright fire, or even on the coals themselves. This is perhaps the most primitive mode of preparing meat for eating, as may be supposed from the great ease and simplicity with which the operation is managed. Broiling is, in fact, a quicker sort of roasting. The albumen

of the outside being sealed up at once, the meat is cooked in its own juices and rendered extremely nutritious. But to broil meat so as to preserve its odour, juice, and fat, requires care. The fire should be perfectly clear. Just before setting the gridiron over, some salt should be sprinkled on it to prevent the flare. The gridiron should be perfectly clean, and warmed and greased with suet before using. The meat should never be touched with a fork, but turned rapidly with the broiling tongs.

Broke, SIR PHILIP BOWES VERE (1776-1841), rear-admiral, born at Broke Hall, near Ipswich, entered the service in 1792, was made captain in 1801, and appointed to the *Shannon* frigate, 38 guns, in 1806. In her he fought the memorable duel with the American *Chesapeake* frigate, off Boston, 1st June 1813, which has made 'brave Broke' ever since a hero in popular English song. The Americans were confident of success, but proved no match for Broke's hardy and thoroughly disciplined men, who, after delivering with excellent effect two terrific broadsides, sprang across the gunwale, and, after a moment's struggle, ran up the English colours fifteen minutes after the commencement of the action. A blow received in boarding seriously affected his health, and he retired from active service with a baronetcy. See his *Life* by Dr Brighton (1866).

Broken Hill, originally a ridge of the Barrier Ranges in the west of New South Wales, about 2 miles long. In 1883 a silver lode varying from 10 to 200 feet in width was discovered running along the top, and has since been mined to a depth of 1500 feet below the surface, the outcrop having been removed by an open cut. The rocks forming the range (mainly gneisses, schists, and garnetiferous sandstones) are bent in an anticlinal fold, and the lode (outcrop of limonite containing 2-30 ounces of silver per ton in numerous vughs, succeeded by 'oxidised' ores containing 4-300 ounces and 'sulphide' ores containing 5-36 ounces) occupies a saddle-shaped cavity formed by the contortion of the strata. Large percentages of lead and—in the sulphide ores—of zinc are also obtained. Before 1883 silver-lead deposits had been discovered in the neighbourhood at Thackerina (1876) and Silverton (1882), which led to the founding of a town at the latter place in 1883; but it was soon overshadowed by the settlement at Broken Hill itself, which is a city of 26,000 people. The ten principal mines had by the end of 1918 produced over 103 million pounds' worth of silver, and paid about £21,600,000 in dividends and bonuses on a capital not quite £7,500,000. The yield is, however, now more fluctuating than of old, both because the lode is altering as it descends and because of strikes; indeed, after the conclusion of the war production ceased altogether for some years.

Broken Hill, a station in Northern Rhodesia, about 300 miles NE. of Livingstone, with a zinc and lead mine. A cave in the mine, 90 feet below ground-level, has yielded great quantities of bones of animals still found in the district, or their near kin, as well as rude stone and bone implements, similar to those of the Bushmen and Hottentots. To a skull (lacking the lower jaw), with a sacrum, tibia, and the ends of a femur, found in 1921, the name *Homo rhodesiensis* has been given. Notwithstanding his apparently late date the Rhodesian man seems to have been in some respects even more primitive than the Neanderthal race, which the skull, with its huge orbital ridges and palate, suggests.

Broken Knees, an expression indicating that a horse has an abrasion, open wound, or scar on the front of his 'knee,' due to his having fallen or 'come down.' And although it may be quite healed

and only a small mark left, he is still a broken-kneed horse, and his value is seriously affected. He never thoroughly regains his previous action.

If the fall has only caused a superficial wound, the case is a simple one; and unless the skin is much bruised, the hair will grow, and the animal may not be permanently blemished. The sheath, however, through which the tendon over the joint passes, may be opened, and the tendon itself injured, or the joint itself may be opened, and this is indicated by a discharge of the joint-oil or synovia, and by the bones being seen. The worst form of accident is that when the bones of the joint are fractured. The system suffers when the wounds are serious, and severe fever sets in.

In treatment, first cleanse the wound with warm water, and, without probing, ascertain its extent. If it be slight and no joint-oil escape, tie the animal's head to the pillar reins, to keep him from lying down, and from injuring the part by knocking it against the wall or manger. Give opening medicine, bran mashies, and a little hay or grass. Dress the wound daily with antiseptic lotions or with antiseptic lint. If the injury be serious and accompanied by fever, the animal must be at once placed in 'slings,' and in addition to the before-mentioned treatment should receive febrifuges and anodynes. When the bones are broken, he should be destroyed. When the wound is thoroughly healed, the hair may not grow rapidly, nor may the swelling altogether disappear; in this case a mild cantharidine ointment, which should act as an irritant, but not as a blister, may be used. In some cases of severe broken knee, it is advisable to fix the limb so that the animal may not move the joint. In veterinary jurisprudence, a broken knee is regarded as a *blemish*, not as an unsoundness.

Broken Wind is a disease or unsoundness of the horse, termed by some old English writers *pur-siness*. It appears in the form of difficulty in the act of expiration, the horse making an extraordinary or second effort to expel from the lungs the air which has readily entered them during inspiration.

A broken-winded horse is usually an animal that does not thrive, is lean, and has a dependent belly, the muscles of which are unusually active as expiratory muscles. The characteristic symptoms are best observed when the horse is exercised, the breathing becoming very laboured, the nostrils dilated, the eyes bloodshot, and even blue, showing imperfect purification of blood in the lungs. There is a low cough, hardly heard a few yards off, and usually accompanied by the passage of flatus from the anus. When the animal is oppressed by fast work, or dragging a load up a hill, the pulse is excessively rapid, and the heart beats energetically.

Low-bred horses are liable to broken wind, especially if fed on innutritious, dusty, and bulky food, and at the same time kept at hard and fast work. It is due to the irritation in the stomach, caused by indigestible food, being reflected from the nerves of the stomach to those of the lungs—in the same way as, with ourselves, disease in one tooth seems to set all the other teeth aching. This indirect irritation causes firstly spasm, and later on relaxation of the little muscles around the air-tubes; consequently too much air gets into the lungs, and causes pressure on the walls of the air-vesicles, terminating in wasting and rupture of them. The result of this is a lessened area for the aeration of the blood, followed usually by debility and loss of condition. On post-mortem examination we find the stomach much distended with food of a dry nature, and its walls thinned. The lungs are lighter in colour, and float much more buoyantly than in health; little or no blood is seen in them, but they contain a large quantity of air, which makes them crackle when pressed.

The treatment of broken wind is very unsatisfactory; and we can only hope for mitigation of the symptoms by keeping the alimentary canal in proper order, administering occasional purgatives, and feeding on a proper quantity of the best oats, which should always be bruised; also by allowing the horse the best hay in spare quantities—viz. from 10 to 12 lb. daily. We may say that broken wind is incurable; and horses very frequently drop down exhausted when at hard work, and die either from congestion of the lungs, hemorrhage, or simple suffocation.

Broken wind is so bad a form of unsoundness, that horse-dealers sometimes attempt, and even successfully, to hide the defect at the time of the sale, and this they do by causing the animal to swallow *shot* or *grease*. A certain portion of lead weighing in the stomach has a wonderful effect in diminishing the symptoms, which become again obvious enough a few hours after the ruse has been practised on some unwary purchaser.

Broker, an agent employed to make bargains and contracts between other persons, in matters of commerce, for a compensation commonly called brokerage. A broker usually confines his attention to one particular market, as wool, sugar, or iron, and the special knowledge he thus acquires renders his services useful to the general merchant, who has no such intimate acquaintance with the trade. The broker is strictly a middle-man, or intermediate negotiator between the parties, finding buyers or sellers as required. He does not act in his own name, nor has he generally the custody of the goods in which he deals, thus differing from a factor, and he cannot sell publicly like an auctioneer unless licensed as such. He is treated as the agent of both parties, though primarily he is deemed the agent of the party by whom he is originally employed. Besides ordinary commercial brokers, there are several other sorts, such as Stock-brokers (see STOCK-EXCHANGE), Share-brokers, Ship-brokers, Insurance-brokers, and Bill-brokers (see BILL). Persons who deal in old furniture and sell and distract furniture for rent are also called brokers, although differing entirely in their occupations from the preceding commercial agents. The business of a Pawnbroker (q.v.) is also of a different nature.

Brokers in London were formerly admitted by the lord mayor and aldermen, paying £5 on admission, and a like sum annually, under a penalty of £100. They were termed sworn or licensed brokers, and a list was kept by the city of brokers admitted, and of those who had been convicted of fraud or disqualified (33 and 34 Vict. chap. 60). The corporation has ceased to grant licenses or exact fees.

By the Larceny Consolidation Act, 24 and 25 Vict. chap. 96, sect. 76, it is enacted that any person who, being a banker, merchant, broker, attorney, or agent, and being intrusted for safe custody with the property of any other persons, shall in any manner convert or appropriate it to his own use, shall be guilty of a misdemeanour, and be liable to be kept in penal servitude from five to seven years, or to suffer some other punishment, by imprisonment for not more than two years, with hard labour or confinement. See FACTOR.

Brokerage is the remuneration or compensation allowed to a Broker (q.v.).

Bromberg, or BYDGOSZCZ, a town of Polish Posen, on the Brahe, 6 miles from its influx to the Vistula, and 99 miles SSW. of Danzig by rail. It has iron-foundries, machine-shops, and manufactures of cloth and paper, distilleries, breweries, and corn-mills. There is a considerable provincial trade both by shipping and railway. The *Brom-*

berg Canal, 17 miles long, by uniting the rivers Netz and Brahe, connects the Oder and Elbe with the Vistula. Pop. 88,000.

Brome, RICHARD, a minor dramatist, of whose life but little is known save that he was of humble origin, having been in his earlier days servant to Ben Jonson, that he lived in familiar friendship with Dekker, Ford, and Shirley, wrote as many as twenty-four popular plays, was a devout believer, though a hater of Presbyterians and Puritans, and died about 1652. His best plays are *The Northern Lass*, a comedy, written mostly in prose, and *The Jovial Crew*. The revival of the latter in 1819 delighted Charles Lamb, who speaks with enthusiastic warmth of this 'protest in favour of air, and clear liberty, and honest license, and blameless assertion of man's original blest charter of blue skies, and vagrancy, and nothing-to-do.' Other plays are *The Lancashire Witches*, written in collaboration with Heywood, *The Court Beggars*, and *The Queen and Concubine*. Brome was a poor poet, and the lyrics interspersed in the plays are very indifferent verse; some fair lines of his in memory of Fletcher are in the 1647 folio of Beaumont and Fletcher. His plays were reprinted in 1873. See Ward's *Dramatic Literature*, ii. (1875), Swinburne's *Contemporaries of Shakespeare* (1919).

Brome-grass (*Bromus*; Gr. *bromos*, 'a kind of oat'), a genus of grasses, very nearly allied to Fescue (q.v.). The species are numerous, and some of them are very common British grasses—none more so than the Soft Brome (*B. mollis*), an annual or biennial, which has very soft downy leaves, grows well on poor soils, and is readily



Brome-grass.

eaten by cattle, but is not much esteemed by farmers, either for the quantity or quality of fodder which it yields. The seeds of some species are unwholesome. *B. secalinus* (rye brome-grass) is a troublesome weed, especially in rye-fields, whence the legends of the transmutations of rye into brome through supernatural agencies. See GRASSES, and PASTURE.

Bromelia'ceæ, an order of monocotyledonous plants, allied to Amaryllidaceæ and Iridaceæ, and of course to Liliaceæ (q.v.), of which, in the larger sense, many systematists reckon all these mere sub-orders. They most resemble Amaryllidaceæ (with which they are practically continuous through *Agave*), but are usually distinguished by their

perianth-whorls differentiated as calyx and corolla, and by their habit. They are usually short stemmed, with close-set long rigid leaves, often spiny or scaly, channelled and sheathing at the base. The species are all natives of the warmer parts of America, although some of them are now naturalised both in Asia and Africa. The best-known plant of the order, and the only one much valued for its fruit, is the Pine-apple (q.v.). Some species, with their strong spiny leaves, form impenetrable thickets. Many of them are epiphytic, or grow upon trees without being parasites, and are often called air-plants. *Tillandsia usneoides*, Beard Moss or Spaniards' Beard of the West Indies and of the southern parts of the United States and Mexico, hangs from the trees like the lichens of colder climates, and gives the foliage of the cypress-groves, where it occurs, a peculiar and melancholy picturesqueness. Many species are known in cultivation, and grown suspended from balconies in South America, or greenhouse roofs in this country, chiefly on account of their peculiar mode of vegetation, sometimes although their flowers are often beautiful and fragrant. Many species are also cultivated as ornamental stove-plants. Species of this order also furnish valuable fibres. *Tillandsia usneoides*, already mentioned, yields a fibre, easily obtained and in great abundance, which is used instead of hair for stuffing mattresses. The fibres of the leaves of the pine-apple, and of some other species of this order, have been made into fabrics resembling the finest white muslin, whilst they are found also to possess sufficient strength for cordage. The produce of different species of *Bromelia* is often included along with that of the American Aloe or *Agave* (q.v.), under the name of *Pita* fibre or Pita flax, the appearance and properties of the fibres being very similar, as well as those also of the fibres of the species of *Yucca*. The fibre of the pine-apple is, in some countries, very frequently twisted into fishing-lines, and made into nets and into ropes intended for immersion in water, being very little liable to injury from this cause.—The pine-apple cloth of the Philippines, called *Pina muslin* and *Batiste d'ananas*, also sometimes erroneously called *grass-cloth*, from which it may be distinguished by its untwisted fibres (see *BÈHMERIA*), is obtained from small-fruited varieties of this and allied species—e.g. *Billbergia ovata*.—The fruit of *B. pinguin*, the Wild Ananas of the West Indies, affords a beverage employed in various ailments.

Bromic Acid, HBrO_3 , is the best-known compound of bromine and oxygen. It is prepared pure by acting on bromine, Br , with bromate of silver, AgBrO_3 , when bromide of silver and bromic acid are produced. Bromic acid is a very unstable acid, being readily decomposed by reducing agents. It forms a whole series of salts called Bromates, none of which are of importance. They are mostly crystalline, but their watery solutions readily decompose when evaporated. When heated, they liberate oxygen and form bromides (see *BROMINE*). Mixed with sulphur or charcoal, they explode by percussion, and in this and other properties resemble the chlorates. See *CHLORIC ACID*.

Bromine (Gr. *bromos*, 'disagreeable smell': sym. Br ; atom. wt., 79.96), one of the halogen elements, occurs in combination in sea-water to the extent of about 1 grain to the gallon. It is found in certain saline springs at Kreuznach and Kissingen in Germany, but the chief source is the Stassfurt salt deposits in Germany and in America. It is also present in marine and land plants and animals. In the extraction of bromine from concentrated sea-water, from which common salt has been separated in quantity, and which is then called *Bittern* (q.v.), or from salt springs, the

liquor—which contains the bromine, as bromide of magnesium, MgBr_2 —trickles down a long tower and meets an ascending current of chlorine. Bromine is formed, which is carried over and condensed. It is then purified by redistillation. Electrolytic methods may displace the older methods of manufacture. They depend on the fact that a solution containing both chloride and bromide on having an electric current passed through it has bromine liberated before any chlorine. Under the proper conditions, all the bromine may be liberated. Bromine is a deep red liquid of density 2.98 at 15°C ., which readily evolves red fumes of a very irritating and suffocating nature. It is very poisonous, acting by destroying the animal tissues. When even a little of its vapour is inhaled, there is danger of spasm of the glottis and consequent suffocation. It is sparingly soluble in water, more so in alcohol and ether, and its watery solution possesses great bleaching properties. When raised to the temperature of 59°C . it boils, and when reduced to -7°C . it becomes a red crystalline solid. Treated with sulphuretted hydrogen, bromine yields hydrobromic acid, HBr , which is the analogue of hydrochloric acid, as bromine is of chlorine. Bromine is a member of the group called halogens, and is intermediate in its properties between chlorine and iodine; e.g. chlorine is a gas, bromine a liquid, and iodine a solid.

Bromides.—Bromine combines very rapidly with most of the metals, occasionally so as to cause ignition, as in the case of antimony, and forms a class of salts usually known as bromides, though perhaps they are rather hydrobromides (see *HYDROBROMIC ACID*). Bromide of silver, which is very sensitive to the sun's rays, is used in photography. Bromide of potassium, which is the most important of the bromides, may be prepared by the action of bromine on solution of caustic potash. The whole is then evaporated to dryness, and ignited along with charcoal. On solution in water and crystallisation, the bromide is obtained in colourless, cubical crystals, possessing a pungent saline taste, and which are very soluble in water. This salt has been used in a very large number of diseases, owing to its powerful sedative properties. Other bromides (such as those of sodium and ammonium) are of less importance, although they possess similar medicinal properties. Hydrobromic acid combines with these the tonic effects of hydrochloric acid. In epilepsy, bromide of potassium affords marked relief. As a sedative in nervous excitement and sleeplessness, its use produces beneficial results, while in delirium tremens and tetanus large doses give relief. In excessively large doses, general depression, lowering of the temperature, and even death may result. And it should be known and remembered that the administration of bromine compounds in large doses and for long periods often leads to unpleasant effects, collectively termed *bromism*. The earliest and most common are skin eruptions, resembling Acne (q.v.) or boils; the further results are due to diminished activity of the nervous system—viz. lassitude, low spirits, weakened brain power, &c. All these symptoms soon disappear when the use of the drug is discontinued.

Bromley, a municipal and parliamentary borough of Kent, on the Ravensbourne, 10 miles SE. of London. Long the residence of the bishops of Rochester, it has a town-hall (1864) and a college for clergymen's widows (1866). Pop. 35,000; parl. bor. (including Baskenham and Penge) 95,000.

Brompton is a district of London in the borough of Kensington, SW. Part of what was once Brompton is now known as South Kensington.

Brompton, once specially a quarter for artists, contains a fine consumption hospital and the Oratory (q.v.).

Bromsebro, a village and castle of Sweden, 27 miles S. of Kalmar. Treaties were signed here between Sweden and Denmark in 1541, 1641, and 1645.

Bromsgrove, a Worcestershire urban district, near the small river Salwarp, 12 miles NNE. of Worcester, and $1\frac{1}{2}$ mile from a station on the Birmingham and Gloucester Railway. Situated in a richly wooded valley, it has a principal street a mile in length, a grammar-school (1553; re-founded 1693), and a fine old church, restored by Sir Gilbert Scott in 1858, with a spire 189 feet high, and monuments of the Talbots. The linen manufacture has been superseded by nail and button making. Pop. 10,000.

Bromwich. See WEST BROMWICH.

Bronchi are the subdivisions of the trachea or windpipe. Opposite the third dorsal vertebra, the windpipe divides into two branches or bronchi, of similar structure to itself—namely, round and cartilaginous in front; and flat, with muscular and fibrous tissue behind, lined with mucous membrane. Of these bronchi, one goes to each lung, the right being little more than an inch; the left, about two inches in length. On entering the substance of the lung, the bronchi divide into smaller branches, which again subdivide, until they are no larger in diameter than $\frac{1}{16}$ th to $\frac{1}{8}$ th of an inch, and give origin to, or terminate in, small polyhedral sacs, which seem to cluster round their extremities, and open into them. These are the *air-cells*; they consist of elastic tissue, with a lining of mucous membrane, and beneath the latter, a layer of minute blood-vessels of the lung. See LUNGS, RESPIRATION.

Bronchitis, or inflammation of the lining membrane of the bronchial tubes, is a disease of very common occurrence in Great Britain and in the United States, and one of the greatest importance, for, though in most cases completely recovered from, it may, if it becomes chronic, lead to premature and miserable old age, or even in some cases to speedy death. Moreover, besides occurring independently, it is an extremely common complication in other diseases—e.g. in fevers, and in affections of the heart or kidney. It is usually caused by exposure to cold; but persons whose occupations expose them to the constant inhalation of irritating dust (masons, needle-grinders, and many others), often suffer from a form of bronchitis which is extremely apt to lead to disease of the lungs. The first symptoms of acute bronchitis are generally those which distinguish a common cold—viz. shivering, headache, and sense of weariness, with occasional cough; but the cough continues, and recurs in paroxysms; there is a feeling of oppression on the chest and pain behind the breastbone on coughing, and the person *wheezes* when he breathes. He also breathes more rapidly, six or ten respirations in the minute more than he did when in health, his pulse is quicker, and his temperature a little above normal; and the ear applied to his chest, after these symptoms have continued for two or three days, will hear whistling and rattling noises, produced by the passage of the air through parts of the bronchial tubes narrowed by swelling of the mucous membrane and by the excessive amount of mucus which it secretes. This mucus should be dislodged by coughing and spat up. If the inflammation extend no farther than the larger bronchial tubes, it is termed *tubular* bronchitis, and is seldom a fatal disease in the first attack. When the minute ramifications of the bronchial tubes are chiefly or alone affected, either

from the first or by downward extension of the inflammation, this form is called *capillary* bronchitis. It occurs especially among young children and very old people, in whom it forms a very serious and frequently fatal malady. In such a case the cough and associated pain may be less severe, but all the other symptoms—feverishness, distress, prostration, &c.—are much more intense than in the milder form. The breathing may be so embarrassed that the patient can no longer lie down, but requires to sit up, and use all his muscles of respiration. Though he coughs, he spits very little till about the third day, when he spits large quantities of yellow fluid. At last prostration becomes so complete that he ceases to spit, the heart's action becomes greatly embarrassed, and he dies suffocated by the accumulated mucus.

A patient who has once had acute bronchitis is very apt to suffer from it again, and after one or many attacks the disease may become chronic. *Chronic* bronchitis leads to important structural changes in the lungs, especially Emphysema (q.v.), to consequent embarrassment of the respiration and circulation, with secondary changes in other organs, and is generally fatal, though, it may be, not for many years. The patient is always liable to severer attacks, much resembling acute bronchitis, and often induced by very slight causes.

The treatment of bronchitis must vary with the patient's constitution; but in most cases, counter-irritation, applied through the medium of mustard or hot turpentine fomentations, will be found very useful. These remedies act more rapidly than a blister, and may be frequently repeated. It is of the greatest importance that the patient should remain in a warm, equable, and moist atmosphere. In the early stages, before free expectoration is established, ipecacuanha is generally the most useful remedy; but it should be remembered that patients suffering from bronchitis are very easily depressed, especially after the first few days, and then stimulating expectorants, such as ammonia, squills, balsams, should be added. In very acute cases, after a brisk purge, an emetic is often very useful to remove accumulations of mucus. In some cases of bronchitis, the persistence of the disease depends upon some constitutional weakness (gout, syphilis, &c.); and no treatment will effect a cure unless it include remedies for the particular condition which may be present.

In chronic bronchitis, avoidance of the causes which lead to 'catching cold' is of the utmost importance. Residence during the winter in a mild, equable climate, or confinement to a well-warmed house, is sometimes the only measure that will be of much service. The exacerbations must be treated on the same principles as acute bronchitis. In the chronic bronchitis of old persons, the addition of iodide of potassium to soothing remedies is very useful; but opium must be given with great caution, or not at all, as it tends to diminish the expectoration of mucus from inflamed tubes. The paregoric elixir (compound tincture of camphor) is an old and popular remedy in bronchitis, but enough has been said to impress on the reader the danger of tampering with bronchitis. In every case where it is possible, a skilled medical man should be employed, to determine, by the stethoscope, not only the disease but its exact situation and cause; and as it is but too likely to recur at some future period, or symptoms caused by it to appear, a skilled opinion has a permanent value to the patient. See CATARRH.

Bronchocele. See GOITRE.

Bröndsted, PETER OLUF, a Danish archaeologist, born near Horsens, in Jutland, 1780, studied at Copenhagen, where in 1813, after some years

spent in travels and excavations in Italy and Greece, he was appointed extraordinary professor of Philology. Returning to Rome in 1818 as agent of the Danish government, he was enabled to carry on his researches for several years. He died rector of the Copenhagen University in 1842. Bröndsted's principal work is his *Reisen und Untersuchungen in Griechenland* (Stuttgart, 1826-30), of which only 2 vols. were published.

Brongniart, ALEXANDRE, an eminent French scientist, born at Paris, 1770; became in 1797 professor of Natural History at the École des Quatre Nations, and afterwards in the Museum of Natural History. Appointed in 1800 director of the porcelain manufactory at Sèvres, he held that office for the remainder of his life, and revived the almost lost art of painting on glass. In his *Essai d'une Classification des Reptiles* (1805), he proposed the fourfold division of reptiles into Saurians, Batrachians, Chelonians, and Ophidians. His *Traité Élémentaire de Minéralogie*, published in 1807 at the instance of the Imperial University, became a text-book for lecturers. In 1814 appeared his monograph on Trilobites, a name which, as well as a basis of classification for those singular crustacea, naturalists owe to Brongniart. In 1815 he was elected a member of the Academy, and shortly after made a careful study of the geology of Italy and Switzerland, and of Scandinavia. In 1829 he published the *Tableau des Terrains qui composent l'Ecorce du Globe*, and in 1835 he collaborated with Cuvier in preparing the admirable *Description Géologique et Minéralogique des Environs de Paris*. In 1845 appeared his *Traité des Arts Céramiques*. He died October 7, 1847.—His son, ADOLPHE THÉODORE, was a botanist of some note. He was born in Paris (1801), in 1833 became professor of Botany at the Jardin des Plantes, and in 1852 was made inspector-general of the Scientific Faculties of France. He died in 1876. His principal work is the *Histoire des Végétaux Fossiles* (2 vols. 1828-47).

Broni, a town of Northern Italy, with mineral springs, 11 miles SE. of Pavia. Near by is the castle of Broni, where Prince Eugène obtained a victory over the French in 1703. Pop. 7000.

Bronn, HEINRICH GEORG, a German naturalist, born at Ziegelhausen, 1800, was educated at Heidelberg, where in 1828 he commenced a course of lectures on natural history and palæontology. In 1833 he was nominated professor of Physics, and was afterwards appointed to the zoological lectureship. In 1834 appeared his most important geological work, *Lethæa Geognostica*; in 1841-49 his *Geschichte der Natur*; and in 1850 his *Allgemeine Zoologie*, which was the first attempt to develop zoology in its entirety with reference to extinct organisms. Bronn died 5th July 1862.

Brontë, a town of Sicily, situated at the western base of Mount Etna, 33 miles NW. of Catania. The lava streams of 1651 and 1843 lie on either side, but the district around is fertile, and produces wine. Lord Nelson was created Duke of Bronte by the Neapolitan government in 1799. Pop. 20,000.

Brontë, CHARLOTTE, third child of the Rev. Patrick Brontë (originally Prunty) and Mary Branwell, his wife, was born at Thornton, Bradford, 21st April 1816. Her father was an Irishman of County Down, a man of strong character and some literary talent. His wife, who was a native of Penzance, died of cancer on 15th September 1821, leaving behind her six children. By this time Patrick Brontë had removed to Haworth, where he remained to his death. It was a large village of nearly five thousand inhabitants, most of the people being engaged in the woollen manufacture.

The motherless children were cared for by their aunt, Miss Branwell, and they displayed an extraordinary precocity of talent. Their father treated them as his intellectual equals, and discussed with them the public affairs of the day. They had very little intercourse with their neighbours; their refuge was in the unenclosed, untilled, heathery moors, with their becks and hollows. The two eldest daughters were sent, in July 1824, to a school for clergymen's daughters at Cowan Bridge near Kirkby-Lonsdale, and Charlotte and Emily followed in September. A low fever broke out in the school, and Maria and Elizabeth became seriously ill, and were taken home only to die. Though Charlotte was but eight years old, the habit of observation had set in, and rightly or wrongly she attributed the death of her sisters to cruel treatment at school, an injury avenged in the opening scenes of *Jane Eyre*. At Haworth, where the diminished family now gathered, Miss Branwell gave the girls lessons, and their father told them the news. The three sisters, Charlotte, Emily Jane, and Anne, and their brother, Branwell, devoted themselves to writing, and Charlotte composed in a few years some twenty or thirty tales as well as many poems. In 1831 she went again to school at Roe Head, a country house near Mirfield, and made the friendship of Ellen Nussey and Mary and Martha Taylor. On her letters to Miss Nussey our knowledge of her life is mainly based. Mary and Martha Taylor suggested the Rose and Jessie Yorke of *Shirley*. Returning to her home in 1832, she found that her brother Branwell had contracted vicious habits, and he was to the last a source of increasing misery to the family. She had experiences as a school-teacher, and as a governess at a salary of £20 a year; the discipline of teaching was pronounced 'equally painful and priceless.' The sisters began to think of starting a school, and in February 1842 Charlotte and Emily went to Brussels in order to improve their knowledge of foreign languages. They entered the school kept by M. Heger and his wife in the Rue d'Isabelle.

There can be no doubt that this was a decisive event in Charlotte Brontë's life. M. Heger was a man of accomplishment, enthusiastic and religious in his nature. His pupil regarded him with steadily growing affection and admiration. He recognised her gifts and pitied her loneliness. After spending nine months at Brussels, the Brontë girls returned to Haworth Vicarage on the death of their aunt. Emily remained at home to keep house for her father, but Charlotte returned to Brussels. She wrote to Miss Nussey: 'I returned to Brussels after aunt's death against my conscience, prompted by what then seemed an irresistible impulse. I was punished for my selfish folly by a total withdrawal, for more than two years, of happiness and peace of mind.' During this second period at Brussels she instructed M. Heger and his brother-in-law in English. She suffered much from low spirits, and on one occasion, like Lucy Snowe, paid a visit to the confessional at St Gudule. She says to Emily: 'I actually did confess—a real confession,' a confession which she herself ascribes to caprice. She had no leanings towards Catholicism. By the advice of her friend Mary Taylor she suddenly returned on 18th January 1844. A month after she wrote: 'I suffered much before I left Brussels. I think however long I live I shall not forget what the parting with M. Heger cost me.' She carried on a rather one-sided correspondence with her teacher for eighteen months. Her letters, long believed to be lost, were published in 1913. They express an abject devotion, but its exact nature may be variously interpreted.

She returned to a very gloomy home. Her

brother Branwell, who had become thoroughly vicious—an opium-eater, a drunkard, and a confirmed liar—was dismissed from a situation as tutor, returned to his father's house, and after years of steady deterioration, during which his sisters endured unspeakable agonies, died in September 1848. He was intellectually the weakest of the family. The enforced contact with shameless vice from which the sisters had to suffer left its mark upon their works.

The three sisters put together a little volume of verses, published at their expense, in May 1846. They adopted the pseudonyms Currer, Ellis, and Acton Bell. One or two critics recognised the excellence of Ellis Bell's (Emily Brontë's) work, but it appears that only two copies of the book were sold. Later on Charlotte Brontë reissued the volume, with additional poems from the literary remains of Ellis and Acton Bell. She had written a novel, *The Professor*, based on her Brussels experience, and sent it to various publishers. The manuscript shows that the title originally chosen was *The Master*. It went to six publishers, and was returned without comment; but Mr W. S. Williams, the reader to Messrs Smith, Elder, and Co., saw its value, and Miss Brontë was advised to write a novel of the three-volume size. *The Professor* made only two regulation volumes; otherwise it would probably have been accepted. The book did not appear till after its author's death, and has been unaccountably depreciated by critics; it is, however, an exquisitely fresh and tender love-story, and the heroine, Frances Evans Henri, is perhaps the most charming in Charlotte Brontë's gallery. It gives full proof of the writer's power, and she herself never swerved in her high estimate of its value. It is a story of the love between a master and his pupil, a subject from which her thoughts never moved far. Messrs Smith and Elder couched their refusal of the tale in such reasonable and courteous terms as were almost an encouragement. Miss Brontë replied that she had a second narrative in three volumes now in progress and nearly completed, to which she had endeavoured to impart a more vivid interest than belonged to *The Professor*. It was accepted, printed, and published by 16th October, and in a very short time, and without the aid of the critics, attained a great success. One of its reviewers thus commenced his article: 'Since the publication of *Grantley Manor* no novel has created so much sensation as *Jane Eyre*.' The secret of Miss Brontë's triumph is not at all obscure. She combined passion with power of expression. The glow and energy of the story held its readers captive. Very soon there came fierce protests against its unconventionality. The *Quarterly Review* went so far as to suggest that the writer might be a woman 'who for some sufficient reason had long forfeited the society of her sex;' and the *North British Review* followed suit by saying that 'if *Jane Eyre* be the production of a woman, she must be a woman unsexed.' In this, as in all her novels, she describes love not from the man's but from the woman's point of view. It has often been said that Charlotte Brontë's books are autobiographical, and this is true in a very real sense. She drew her characters from life; some of them, she admitted, were merely photographs. But in another sense, equally important, her books do not render the outward part of her own experience. As we know her, Charlotte Brontë was a martyr to her sense of duty. She lived for her family—her father, her sisters, her brother, her servants, and almost denied herself the solace of friendship. But her heroines have no tie to home or family: they are able to choose and shape their destinies. The

second edition of *Jane Eyre*, with a dedication to Thackeray, appeared in January 1848. Thackeray had already expressed his admiration of the book, though he complained that the plot was familiar to him. Miss Brontë said meekly that she had read few novels, and that she imagined the plot was original. Her intense but strictly critical and qualified admiration of Thackeray seems to have been based entirely on *Vanity Fair*.

There was eager speculation on the authorship of *Jane Eyre*. Many critics thought the book must have been written by a man. Others believed that a man and a woman had been at work together, and the names of Barry Cornwall and his wife were suggested. But one critic said: 'We, for our part, cannot doubt that the work is written by a female, and, as certain provincialisms indicate, by one from the north of England.' It is impossible to trace the literary connections of *Jane Eyre*, but it has been suggested that in Charlotte Brontë's conception of love there are distinct traces of Harriet Martineau's forgotten novel, *Deerbrook*. There are also hints of the influence of *Pamela*, which, we know, was read by her father, and imitated by him in a little book. The attempts to suggest foreign origins are not plausible.

Charlotte Brontë, who had kept her secret even from her publishers, went up to London in July 1846 with her sister Anne and revealed herself. Branwell Brontë died, as we have said, in September 1848, Emily in December, and Anne Brontë in May 1849. During this painful time Charlotte was writing *Shirley*, which is the brightest of her stories. Nearly every character in the book was a Yorkshire friend. It was impossible any longer to hide the secret of the authorship. The Yorke family in particular were 'almost daguerreotypes' of the Taylors. Shirley Keeldar, the heroine, represents traces of her sister Emily; Louis Moore, the tutor, is the inevitable M. Héger; Mr Helstone is a Mr Roberson, a fighting Tory parson of the thirties. *Shirley* expressed Charlotte Brontë in her happiest mood, and will always be the favourite novel of many readers, though *Jane Eyre* has been more esteemed by the public and *Villette* by the critics.

Her genius had by this time brought her into a circle of friendly admirers, and among others she came to know Thackeray, G. H. Lewes, Mrs Gaskell, and Miss Martineau. With none of these, however, was she on terms of real intimacy. She was shy and shrinking, melancholy and self-conscious, and her feeble, nervous, suffering body was always sinking to its fall. There could be no greater contrast than that between her fiery soul and her extreme reserve and timidity. Outwardly her life was one of decorous, uneventful simplicity, but as a writer she plunged boldly into the whirl of passion, and never hesitated to lay bare the innermost feelings. Yet her friendships and her fame gave her pleasure. 'How should I be with youth past, sisters lost, a resident in a moorland parish where there is not a single educated family? In that case I should have no world at all: the raven, weary of surveying the deluge and without an ark to return to, would be my type. As it is, something like a hope and motive sustains me still.'

Villette, her last completed story, and artistically the most perfect of all, is a reproduction of her life in Brussels, with touches from more recent experience. It appeared in the beginning of 1853. Her publisher, Mr George Smith, and his mother are among the characters, and it contains a description of Rachel's acting which she had seen in London. The book was received with a burst of acclamation. Harriet Martineau protested against the place it gave to love, and

Anglican journals against its attacks on sacerdotalism. But its picture of love, its romance, its poetry, its sarcasm, and occasional playfulness captivated the world. *Villette* is an autobiography in the fullest sense of the word. Charlotte herself is Lucy Snowe, and M. Heger is Paul Emanuel. Her father urged that the story should end happily with the marriage of the professor and his pupil. The novelist, however, was inflexible. Amidst all the praise the writer's heart was sinking. Her courage was failing; the oppressive quietness of her home-life crushed her spirits. Solitude fearfully aggravated other evils. Her father's curate, Mr A. B. Nicholls (1817-1906), had long courted her. Though Miss Brontë esteemed him, she found him narrow and uncongenial in feelings and tastes. Her father furiously opposed the match; he thought that his famous daughter would be throwing herself away on a curate with £100 a year. Miss Brontë was touched at last by the steadfast devotion of Mr Nicholls, her father yielded, and she was married on 19th June 1854. After a visit with her husband to his Irish relations, she returned to Haworth. Her married life was very happy, but her health became precarious; she sank steadily, and died on 31st March 1855 of an illness incidental to childbirth. Her last words were: 'Oh, I am not going to die, am I? He will not separate us, we have been so happy.' So ended a deeply shadowed life. Her early friend, Mary Taylor, declared that Mrs Gaskell's biography was 'not so gloomy as the truth,' that Miss Brontë had lived all her days in a walking nightmare of poverty and self-suppression.

EMILY JANE BRONTË was born at Thornton in 1818, and died at Haworth on 19th December 1848, leaving behind her one imperishable novel, *Wuthering Heights*, and some poems which cannot be forgotten. She was an enigma in life; she remains an enigma in death. She went in infancy to the school at Cowan Bridge, and was for some time in 1836 a teacher in a school at Halifax, where she worked from six in the morning till eleven at night. Later on, she was with Charlotte during her first period at Brussels. For the rest, she remained at Haworth, and is said to have been an excellent housekeeper. She had no intimacies except with her sister Anne, and their correspondence has been destroyed. Her two sisters, her father, her brother, her dog, and the old servant in the house were necessary to her, but she never studied their comfort nor returned their confidence. It was said of her that she never showed a regard for any human creature, that all her love was reserved for animals. This is an exaggeration; but her reserve was extreme. She could not live away from the moors, and whenever she was absent she suffered from vehement home-sickness. Miss Nussey tells us that on the top of a moor or in a deep glen she was a child in spirit for glee and enjoyment, that few people had the gift of looking and smiling as she could look and smile. The only man for whom she showed any friendship was a curate, Mr Weightman. She had an exceptional gift for music. Her poems showed remarkable force and vigour, as well as deep feeling. Her creed was never put into explicit form, but it is manifest that she was far from adopting the doctrines of the Church. In December 1847 her novel, *Wuthering Heights*, was published by T. C. Newby, with her sister Anne's story, *Agnes Grey*, the two making three volumes. Newby was a commission publisher of no high character. The sisters paid him £50, and he issued an edition of two hundred and fifty copies. Charlotte Brontë went over it carefully after Emily's death, and editions have been printed with and without her corrections. Emily Brontë did not live long

enough to witness its recognition; she died on 19th December 1848, refusing medical advice, doggedly rejecting sympathy, and clinging passionately to life. The earlier critics of *Wuthering Heights* dwelt on its inhuman characteristics, and it obtained its first recognition from Sydney Dobell in an article published in the *Palladium*. Dobell refused to believe that Ellis Bell and Currer Bell were distinct, and urged Currer Bell to write as she wrote in *Wuthering Heights*. Though he deprecated the employment of the author's wonderful pencil on a picture so destitute of moral beauty and human worth, he declared that *Wuthering Heights* was such an elaboration of a rare and fearful form of mental disease—so terribly strong, so exquisitely subtle—with such niceties in its transitions, such intimate symptomatic truth in its details, as to be at once a psychological and medical study. The book bore everywhere the stamp of high genius, though one looked back at the whole story as to a world of brilliant figures in an atmosphere of mist. Dobell's judgment was confirmed by Matthew Arnold, who wrote of Emily as one

Whose soul
Knew no fellow for might,
Passion, vehemence, grief,
Daring, since Byron died.

Swinburne in a noble panegyric reckons her the greatest genius of the Brontë sisters.

The attempts made by Dr Wright to find the origin of *Wuthering Heights* in Irish stories, and by Mrs Humphry Ward to connect the book with the German romantic movement, have failed. Equally without foundation is the story that Branwell Brontë had a share in the book. Charlotte Brontë writes after his death: 'My unhappy brother never knew what his sisters had done in literature—he was not aware that they had ever published anything.' She also points out that her sisters wrote from the impulse of nature, the dictates of intuition, and their stores of observation. Emily Brontë remains the sphinx of literature.

ANNE BRONTË would have been forgotten if it had not been for her sisters. Born at Thornton in 1820, she died at Scarborough in May 1849. She had two uncomfortable experiences as a governess; but, with the exception of a visit to London, she only once left her native county. She was in every way more normal than her sisters, gentle, pleasing in appearance, and intellectually commonplace. She was devoutly evangelical, but declined to believe in the doctrine of eternal punishment. The poems were first made completely accessible in 1920. Her two books, *Agnes Grey* and *The Tenant of Wildfell Hall*, have value as throwing light on the Brontë experience; in some of her religious poems she rises above mediocrity. But it is perhaps to be regretted that her novels, especially *The Tenant of Wildfell Hall*, should continue to be reprinted. This was Charlotte Brontë's opinion. Anne had none of the power and fire of her sisters, but was almost as taciturn as they.

See *The Life of Charlotte Brontë*, by Mrs Gaskell (1857); Charlotte Brontë's memoir of her sisters; *A Note on Charlotte Brontë*, by A. C. Swinburne (1877); *Charlotte Brontë, a Monograph*, by Sir Wemyss Reid (1877); Miss Robinson's (Mme. Duclaux's) study on Emily (1883), and Augustine Birrell's on Charlotte (1887); the *Transactions of the Brontë Society*, including a bibliography (1894); Clement K. Shorter, *Charlotte Brontë and her Circle* (1896; expanded later as *The Brontës and their Circle*), *Charlotte Brontë and her Sisters* (1905), and *The Brontës: Life and Letters* (1908); Dimnet, *Les Sœurs Brontë* (1910); May Sinclair, *The Three Brontës* (1912). The Haworth Edition of the Works of the three sisters includes Mrs Gaskell's Life, and introductions and notes by Mrs Humphry Ward and Clement Shorter.

BRONX, THE, the northernmost of the five boroughs of New York City (q.v.).

Bronze is defined as an alloy of copper and tin containing more than 50 per cent. of copper. Neither ancient nor modern bronzes consist always of only these two metals. Zinc, lead, and even silver are often present in Greek and Roman bronze objects, although the general result of analysis of these shows a composition of from 80 to 90 parts copper to 10 or 12 of tin. Some of the fine French bronze statues of the time of the Renaissance are made of an alloy of nearly this composition—copper 92, tin 2, zinc 5, lead 1. This would now be called a brass. Much of our modern statuary consists of bronze varying from 10 parts copper and 1 of tin—a proportion recommended by Sir H. Davy—to 8 parts copper and 2 of tin. Some zinc or lead, or both, as well as other metals, are occasionally substituted for part of the tin.

Alloys of copper and tin have been classified in this way: 12 to 20 parts copper with 1 of tin yield red-coloured alloys; 5 to 10 parts copper with 1 of tin yield alloys of strength; 2 to 4 parts copper with 1 of tin yield alloys of sound (bell-metal; see BELL); $\frac{1}{2}$ to 2 parts copper with 1 of tin yield alloys of reflection (speculum metal). The alloys of strength here referred to include the bronze used for statues, and also that, sometimes called gun-metal, employed for bearings and other parts of machinery, as well as the alloys of which cannon are, or perhaps we should rather say were, made. A good deal of the bronze for all three purposes is very similar in composition.

Alloys of copper, tin, and zinc, employed for parts of engines and other machinery, are frequently called brass, as well as gun-metal, and are referred to under the head BRASS; and see ALUMINIUM.

For some engineering purposes bronze is improved by the addition of a little manganese, with or without zinc. A small quantity of silicon gives great tensile strength. It is difficult to make ordinary bronze a quite homogeneous compound. An alloy more perfect in this respect is formed when copper is mixed with tin phosphide instead of metallic tin. The phosphorus, which is added to the extent of from 0.25 to 2.5 per cent., makes the bronze harder, more elastic, and of greater tenacity. This alloy suits best for machinery purposes, for which it is now largely employed, when the proportion of tin is from 7 to 8 per cent. Phosphor-bronze is used for bearings of shafts, piston-rings, pump-rods, propellers, boiler-fittings, and other parts of engineering work. Ornamental castings are also made of it.

History.—An account is given in the next article of the use of bronze in prehistoric times during the Bronze Age. Bronze has been used from early times for statues and statuettes, chiefly representations of deities, as well as for ornamental purposes, in India and China. The brass referred to in the Bible was no doubt bronze (see BRASS). The Egyptians, Greeks, Etruscans, Romans, and other ancient nations employed bronze not only for art objects pure and simple, but for a great number of useful articles, very many of these, however, being artistically decorated. The magnificent collection of bronzes in the National Museum at Naples shows, almost at a glance, how extensive was the use of this alloy for articles of daily and domestic use. It is believed that both the Greeks and Romans, for such objects as swords, spears, saws, razors, and other tools, were able to make an alloy of copper and tin which surpassed modern bronze in some properties, and that they possessed some method of tempering bronze, the secret of which has been lost. The Japanese, who are very clever workers in inlaid metals, make bronze of several colours, such as black, blue, purple, and green. These are

all different mixtures. See BED, LAMP, MIRROR, SCULPTURE, SWORD, and VASE; also BRASS, BRONZING, CAST, FOUNDRY.

Bronze Age, a term in prehistoric archæology, denoting the condition or stage of culture of a people using bronze as the material for cutting-implements and weapons. As a stage of culture, it comes in between the use of stone and the use of

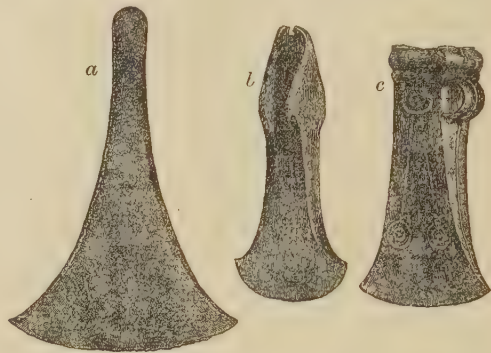


Fig. 1.—Bronze Axes:

a, flat, 16 $\frac{1}{2}$ inches in length; b, flanged, 6 inches; c, socketed, 5 $\frac{1}{2}$ inches.

iron for these purposes. In some regions a Copper Age precedes it. In Europe and Asia the knowledge and use of bronze seems to have spread from Turkestan and Khorasan about four thousand years ago. The bronze age is not an absolute division of time, but a relative condition of culture, which in some areas may have been reached earlier, in others later, while in some it may have been prolonged, and in others brief, or even, as in the Polynesian area, it may have been non-existent in consequence of the people passing directly from the use of stone to that of iron. A bronze-age people in one region may thus have been contemporary with a stone-age people in another, and with an iron-age people in a third; that is to say, the succession of the three ages was not necessarily synchronous, either in contiguous or in widely separated areas. The Homeric poems depict the culture of a people passing from the use of bronze to that of iron. The Mexicans and Peruvians, on the other hand, were still in their bronze age in recent times. The bronze age of Europe generally is marked by the use of certain forms of implements and weapons, as well as by certain conditions of life and customs of burial, which differed from those of the preceding age of stone and of the succeeding age of iron. The implements and weapons of the bronze age include knives, saws, sickles, awls, gouges, hammers, anvils, axes (fig. 1), swords, daggers (fig. 2), spears (fig. 3), arrows, shields (fig. 4). The forms of each class differ in different areas, and vary with advancing time. Blades and axes,



Fig. 2.

a, Bronze sword found in Edinburgh, 20 inches in length; b, Danish bronze dagger, 13 inches in length.

The forms of each class differ in different areas, and vary with advancing time. Blades and axes,

which were at first made with tangs to be inserted in the handles, became socketed for the insertion of the handles; and articles which it was at first the custom to finish in the mould were finished with the hammer, and shields, and vessels made of hammered

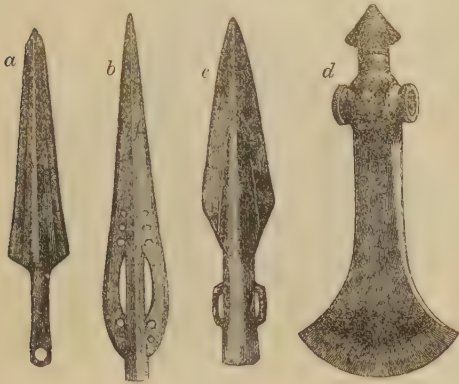


Fig. 3.

a, Tanged bronze spear-head, 10½ inches in length; b, socketed bronze spear-head, 19 inches; c, looped bronze spear-head, 9 inches in length; d, Danish battle-axe, 15 inches.

plates riveted together were ornamented with repoussé work. The ornamentation of the bronze age consists chiefly of concentric circles, spirals, and bosses. The workmanship is always of a very high order, the shapes graceful, and the finish fine. The moulds used for casting were of stone, or bronze, or clay. The system of coring was carried

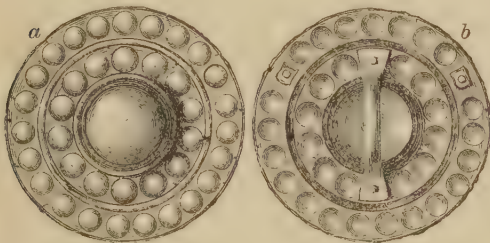


Fig. 4.

Bronze shield (a, front; b, back view), 18½ inches in diameter.

to great perfection, and many of the more difficult castings were turned out in a manner that would do credit to the most expert of modern workmen. The composition of the bronze varied considerably, but may be stated in general as about 90 per cent. of copper to 10 per cent. of tin. The bronze age civilisation of Minoan Crete (q.v.), about 1300 B.C., was splendid beyond anything suspected till the recent excavations at Knossos and elsewhere.

See Evans's *Bronze Implements of Great Britain*; Chantre's *Âge du Bronze en France*; Anderson's *Scotland in Pagan Times* (1886); Abercrombie, *Bronze Age Pottery* (1912); and works named under *ARCHEOLOGY* and *CRETE*.

Bronze-wing, a name given in Australia to certain kinds of wild pigeon, on account of the lustrous bronze colour with which their wings are variously marked.—The Common Bronze-wing or Bronze-winged Ground Dove (*Phaps chalcoptera*) is often seen in flocks, feeds on the ground, and builds its nest chiefly on low branches of trees growing on meadow-lands or near water. It often flies long distances to water, and may be followed as a guide. It is a plump bird, often weighing fully a pound, and is acceptable at every table.—The

Brush Bronze-wing or Little Bronze Pigeon (*P. elegans*) is not so plentiful nor so widely distributed, found chiefly in Tasmania and the southern parts of Australia. It inhabits low swampy grounds, never perches on trees, resembles a partridge in its habits, and makes a loud burring noise like a partridge when it takes wing on being alarmed.—The Harlequin Bronze-wing (*P. histrionica*) is found in the north-western parts of New South Wales in great flocks, feeding on seeds.—Some of the species of *Ocyphaps*, another of the genera or sub-genera of the *Columbidæ*, are also sometimes called Bronze-wing. Their partridge-like appearance and habits have gained for them the name of Partridge Pigeon (see *PIGEON*, *COLUMBIDÆ*).

Bronzing. An imitation of bronze may be produced on the surface of other alloys and metals either by corrosive chemical solutions, which is the most efficient way, or by coating them with varnish and bronze powder. In most large towns bronzing-liquor for brass and zinc can be purchased where chemicals are sold. Bronzing is very largely applied to brass-works of various kinds, and especially to gas-fittings. For this purpose the following solutions are used, but the brass is first pickled with nitric acid and scoured with sand and water, or it may be treated with a potash solution.

For dark olive-green bronze, hydrochloric acid and arsenic; sometimes iron scales are added. Afterwards brush with black lead and coat with yellow lacquer. For steel-gray bronze, boiling solution of chloride of arsenic. For brown bronze, solution of the nitrate or perchloride of iron. For black bronze, solution of the chloride of platinum. To produce on new bronze an imitation of the patina on an antique bronze, a mixture in hot water of sal-ammoniac, cream of tartar, common salt, and nitrate of copper is used. Salt of sorrel, sal-ammoniac, and vinegar is another mixture employed.

Iron castings are very effectively bronzed by covering them with an electro deposit of copper in the form of a thin film or layer, which can then be darkened by any of the chemical bronzing solutions, and either lacquered or varnished. The copper surface is often simply varnished. Many beautiful foreign statuettes in zinc are also bronzed in this way. See *ELECTRO-METALLURGY*.

A brown colour, sometimes called a *bronzing*, is given to the surface of iron and steel objects by a concentrated solution of trichloride of antimony (liquid butter of antimony), having a specific gravity of 1.35; as for gun barrels.

Metal, wood, plaster of Paris, and other materials can be coated with gold or bronze powders in the form of a paint. When bronze powder is used, the wood or plaster first receives three or four coats of yellow oil-paint, then two coats of a mixture of the bronze powder with flat varnish, and finally this is covered with another layer of varnish.

Bronzino, IL, a name given to several Italian painters.—(1) AGNOLO DI COSIMO (1502-72), born at Monticelli, was a pupil of Raffaellino del Garbo and Jacopo da Pontormo, and was influenced by Michelangelo. He is best known for his portraits, including Cosimo I., Eleonora de Toledo, and Ugolino Martelli, and for 'Christ's Descent into Hell'.—(2) ALESSANDRO ALLORI (1535-1607), his nephew and pupil, born in Florence, painted frescoes and altar-pieces.—(3) Alessandro's son and pupil, CRISTOFANO (1577-1621), was also born in Florence. He painted 'Judith with the Head of Holofernes,' portraits, and altar-pieces.

Bronzite, a rock-forming mineral, one of the Pyroxenes (q.v.).

Brooch, an ornamental pin or instrument for fastening the dress, consisting for the most

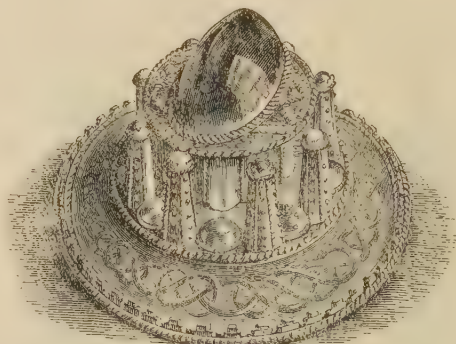
part either of a ring or disc, or of a semicircle, there being a pin in either case passing across it, fastened at one end with a joint or loop, and at the other with a hook. The oldest known brooches are those found in graves assigned to the early iron age of Southern Europe. They are made of bronze, and consist of a bent or bow-shaped body, with a spring pin coming from a spiral twist at one end, and its point fitting into a loop of the bow at the other end, like the modern 'safety' shawl-pin. They are exceedingly varied in form, often presenting grotesque imitations of the shapes of animals. The form which prevailed in Northern Europe was more massive, having a cross-bar at one end, and covered with chased ornamentation inlaid with gold. In Scandinavia a peculiar form of brooch of brass of oval bowl-shape, covered with dragonesque ornamentation, plated with gold and studded with bosses and coloured pastes, was characteristic of the Viking period. The early Celtic brooches of Scotland and Ireland were penannular, the ring being incomplete, with expanded ends, while the pin, which was loosely looped upon the ring, was greatly longer than the diameter of the brooch. They were made of bronze or silver plated with gold; the flat ring, divided into panels, was richly ornamented with interlaced or spiral patterns, or dragonesque filigree work, peculiar to Celtic art, and studded with settings of amber or coloured glass. The most elaborate work of art of this description is the Tara Brooch, preserved in the museum of the Royal Irish Academy at Dublin, of which a woodcut is subjoined. The finest in



The Tara Brooch.

Scotland is the so-called Hunterston Brooch, which was found in 1830, on the estate of Hunterston, in the parish of West Kilbride, Ayrshire. It is of silver, richly ornamented with gold filigree, elaborately worked into lacertine and ribbon patterns, and set with ornaments of amber; diameter, $4\frac{3}{8}$ inches. On the reverse is an inscription scratched in runes: 'Maelbritha owns this brooch.' The later form of the Highland brooch of brass or silver is annular, having a pin of the length of the diameter of the ring. Those of brass are decorated with chased

patterns of interlaced work, scrolls of foliage, and grotesque animals. Those of silver have their decoration often inlaid with niello, and sometimes enriched with settings. The Ugadale Brooch, in



Brooch of Ugadale.

the possession of Hector Macneal of Ugadale, in Kintyre, which is here figured, is a characteristic example of a form of reliquary brooch of West Highland origin. The Brooch of Lorn, in the possession of Macdougall of Dunolly, near Oban, has the reputation of being identical with one torn from the breast of Robert Bruce by Alexander of Lorn, the ancestor of Macdougall, in a personal contest with the king, but it is also identical in form and character with the Lochbuy Brooch, now in the British Museum, and classed as a work of the 16th century. They are all about $4\frac{1}{2}$ inches in diameter, having a circle of jewelled obelisks rising round a central capsule, crowned by a large rock-crystal. The capsule is removable, and discloses a cavity, designed, doubtless, for the purpose of a reliquary.

Brooke, BARON. See GREVILLE, SIR FULKE.

Brooke, HENRY, born in 1708, at Rantavan, County Cavan, the son of a wealthy clergyman, in 1720 entered Trinity College, Dublin, and in 1724 went to study law in London, where he became the chosen friend of Pope and Lyttelton. From the heart of this brilliant literary society he was recalled to Ireland by a dying aunt, who left him guardian of her child, a girl of twelve, whom he afterwards married. His poem, *Universal Beauty* (1735), is supposed to have supplied the foundation for Erasmus Darwin's *Botanic Garden*. In 1739 he published his play, *Gustavus Vasa*, full of the noblest sentiments and the most inconceivable characters, the acting of which was prohibited at Drury Lane; Dr Johnson writing a satire in vindication of the licensers of the stage. It was afterwards produced in Dublin as the *Patriot*. In 1740 Brooke was taken ill, and returned finally to his native country, where he published several books. He died at Dublin, in a state of mental debility, 10th October 1783. The sonorous eloquence of his plays has not saved them from oblivion; and his novel, *The Fool of Quality*, is the sole survivor of his numerous works. It is distinguished by humour, close observation, simplicity of style, and a religious and philanthropic tone that highly commended it to John Wesley. Kingsley thought that the reader would learn more from it of what was pure, sacred, and eternal, than from any book since the *Faerie Queene*.

Brooke, SIR JAMES, a man strongly imbued with the Elizabethan spirit of adventure, was born at Benares, 29th April 1803, and educated at Norwich. He entered the East India army (1819), was seriously wounded in the Burmese war, and returned

home on furlough (1826). The voyage out to join his regiment was so protracted that he was unable to reach India before his furlough had expired; his appointments consequently lapsed, and he quitted the service in 1830 and returned to England. He now conceived the idea of putting down piracy in the Eastern Archipelago, and of carrying civilisation to the savages. He purchased a small brig and made a voyage to China. On his father's death (1835) he inherited £30,000, and after a cruise in the Mediterranean, sailed in a schooner-yacht from London for Sarawak in 1838. When he arrived there (1839), the uncle of the sultan of Borneo was engaged in a war with some rebel tribes. Brooke lent his assistance, and in return had the title of Raja and Governor of Sarawak conferred upon him, 24th September 1841, the native governor being forced to resign. Brooke immediately set about reforming the government, instituted free trade, and framed a new code of laws. Head-hunting, prevalent among the Dayaks, he made punishable with death, and he vigorously set about the extirpation of piracy. Labuan having been purchased by the British government, he was appointed governor and commander-in-chief, and British commissioner and consul-general in Borneo. Certain charges brought in 1851 against Brooke in the House of Commons in connection with the receipt of 'head-money' for the slain pirates were declared by a Royal Commission to be unsubstantiated; the 'head-money' was received, not by Brooke and his associates, but by the British ships-of-war that had co-operated with him. In 1857 Brooke, who had been superseded in the governorship of Labuan, but who still acted as raja of Sarawak for the sultan of Borneo, was attacked at night in his house by a large body of Chinese, who were irritated at his efforts to prevent opium-smuggling. He defeated them in several fights. The independence of Sarawak was recognised by the English government. The country prospered greatly under his régime: he found the chief town a place of some 1000 inhabitants; he left it a town of 25,000. Brooke visited England several times, and died at Burrator, in Devonshire, 11th June 1868. He was succeeded by his sister's son, SIR CHARLES JOHNSTON BROOKE (1823-1917), and he by his son, CHARLES VYNER BROOKE (b. 1874). See SARAWAK; also *Letters of Sir James Brooke* (1853), and books on him by Jacob (1876) and St John (1879, 1899).

Brooke, RUPERT CHAWNER (1887-1915), a poet of great promise, born at Rugby, was educated there and at King's College, Cambridge, of which he became a fellow in 1913. A naval officer in the Dardanelles expedition, he died at sea near Lemnos. His works include *Poems* (1911), *1914* (1915), *Letters from America* (1916), and a dissertation on John Webster (1916). A collected edition of the *Poems* with a memoir appeared in 1918.

Brooke, STOPFORD AUGUSTUS (1832-1916), writer and preacher, was born in Letterkenny, Donegal. After a brilliant course at Trinity College, Dublin, he took orders, and after holding various curacies, was incumbent of St James's Chapel from 1866 to 1875, thereafter of Bedford Chapel, Bloomsbury, where his sermons, at once rich in thought and graceful in literary form, made him one of the chief preachers in London. In 1880, through inability any longer to believe in miracles, he left the Church of England, but preached for a time in a chapel of his own. Brooke showed fine literary sense and spiritual sympathy in his *Life of Robertson of Brighton*, *Theology in the English Poets*, books on Milton, Tennyson, Browning, Shakespeare, naturalism, the famous *Primer* and other

histories of English literature, besides books on Jesus and sermons. See his *Life and Letters* by Jacks (1917).

Brook Farm, a community on Fourier's principles, 8 miles SW. of Boston, organised in 1840 by George Ripley, and largely an outcome of the Transcendental movement. On an estate of 200 acres, a company of scholars and educated men and women settled down to a communistic experiment, in which each should do his share of the necessary manual work. The phalanstery, 175 feet long and three stories high, was burned down before it was occupied; and the attempt ended in hopeless failure. Hawthorne was one of the founders, and lived for some months on the farm, in which he invested all his savings; a charming memorial of the enterprise is his *Blithedale Romance*.

Brookline. See SPEEDWELL.

Brookline, a suburban town, about 4 miles SW. of Boston, U.S., with numerous handsome villas and parks, and manufactories of philosophical instruments, &c.; pop. 38,000.

Brooklyn, till 1898 the capital of King's County, New York, is now one of the 'boroughs' of New York City (q.v.).

Brooks, CHARLES WILLIAM SHIRLEY (1816-74), editor of *Punch*, was born in London. In 1832 he was articled to an Oswestry attorney, but became a reporter, and settling in London, wrote dramas, contributed to some of the leading periodicals and journals, and for five sessions wrote the Parliamentary Summary for the *Morning Chronicle*. By its proprietors he was sent in 1853 on a mission to report on the condition of labour and the poor in Russia, Syria, and Egypt; and a result of his observations appeared in *The Russians of the South* (1856). In 1851 he formed a connection with *Punch*, of which in 1870 he became editor. His novels include *Aspen Court* (1855), *The Gordian Knot* (1860), *The Silver Cord* (1861), and *Sooner or Later* (1868). See his *Wit and Humour* (1875), and the *Life* by H. Johnson (1899).

Brooks, PHILLIPS (1835-93), born at Boston, Massachusetts, studied at Harvard and elsewhere, and in his cures at Philadelphia (1859-69) and Boston (1869-91) became known as one of the most eloquent and powerful preachers in America. In 1891 he was made Bishop of Massachusetts in the Protestant Episcopal Church. Several volumes of his sermons and lectures (*Lectures on Preaching*, *The Influence of Jesus*) show his independence of judgment and catholicity of spirit. 'O little town of Bethlehem,' a well-known Christmas hymn, was written by him. There is a *Life* of him by A. V. G. Allen (1901).

Broom, a name for several species of shrubs of the genera *Cytisus*, *Genista*, and *Spartium*, of the natural order Leguminosae, sub-order Papilionaceae. —Common Broom, *Cytisus (Savothamnus) scoparius*, is a well-known native of Britain, Europe, and Northern Asia, growing in dry soils, and ornamenting hedge-banks, hills, and bushy places, in May and June, with the large yellow flowers on its straight slender branchlets. The branches are angular, very tough, and much in use for making besoms, as also for baskets. They have also been used for tanning and dyeing; and their fibre has been woven into a coarse strong cloth, and even made into paper. In South Germany it is sometimes planted on sandy wastes for the sake of its fibres; while its ashes are also valuable additions to the soil on account of their high percentage of potash. The whole plant is very bitter, and the young tops and seeds are diuretic, hence the plant is a very unsuitable ingredient of fodder. The flowers were formerly employed in medicine (*flores spartii*), and as a yellow dye; they are much

visited by bees for cross-fertilisation, for which they are very beautifully adapted (see fig.). The mode of diffusion of the seed by the explosive rupture of the dry pod-valves in hot weather is



Branch of Common Broom :
a, flowering branch.

also worthy of notice. Broom inhabits colder climates than furze, reaching to a greater elevation on mountains, and being found beyond the northern limit of furze. It usually varies in size from 2 to 6 feet, but in some localities grows much larger, the wood then being of great value to cabinet-makers and turners. Although sometimes annoying to the forester, it is also capable of rendering him service as a quick-growing shelter to young trees, especially on wind-swept and sandy soils.—Irish Broom (*Cytisus* or *Sarothamnus patens*), not unfrequent as an ornamental plant in British shrubberies, is not at all a native of Ireland, but of Spain and Portugal.—Portugal Broom or White Broom (*C. albus*), a native of the countries bordering on the Mediterranean, is very often planted in Britain as an ornamental shrub, and is much admired for the beauty of its fascicled white flowers, which are produced upon long filiform branches. Its leaves have three leaflets. It sometimes attains a height of 15 or 20 feet.—Spanish Broom (*Spartium junceum*) is a native of the south of Europe, generally growing in dry soils and rocky situations, and attaining a height of 8 feet or upwards. Its branches are upright, round, and rush-like, a characteristic of this genus. They are smooth, and bear only a few small simple leaves, which soon drop off. It is the *Spartium* of the ancients, and the fibre of the branchlets has been used from time immemorial in some parts of Italy, France, and Spain, for making canvas, nets, ropes, &c., and even for the preparation of a kind of linen. Its twigs also are employed for basket-making, and the finer ones for tying up the grapes. In the south of France, the plant is cultivated on dry unproductive soils. The branchlets are made into bundles, dried, beaten, steeped, and washed, in order to the separation of the fibre. It possesses medical properties similar to those of the common broom.—A white-flowered species (*S. monospermum*), occasionally to be seen in British shrubberies, grows abundantly on the loose sands of the coasts of Spain, and produces a similar fibre. It is mentioned by Barth as growing in great abundance in Africa to the south of the Great Desert. Many species somewhat resembling these are occasionally to be seen in Britain among ornamental

plants, some of them often in greenhouses. The Canary Isles produce some remarkable for the fragrance of their flowers.—Dyer's Broom (*Genista tinctoria*) is, with other members of the same genus, a well-known source of yellow colouring matter. This European shrubby plant is thoroughly naturalised in some parts of North America. The name broom is not given to those species of *Cytisus* and *Genista* (q.v.) which do not display in a marked degree the character of having long slender twigs.—Butcher's Broom (q.v.) is a plant of an entirely different family. See also BRUSHES.

Broom-corn, a grass cultivated in North America for the manufacture of brooms and whisks, which are made of the tops of the culms and the branches of the panicle. See SORGHUM.

Broome, SIR FREDERICK NAPIER, was born in Canada in 1842, and emigrated to New Zealand in 1857. Seven years later, on a visit to England, he married Lady Barker, whose *Station Life in New Zealand* (1869) quickly became popular. In 1869, too, Broome, who had meantime returned to England, formed a connection with the *Times*, and began to contribute prose and verse to the magazines. In 1875 he was appointed Colonial Secretary of Natal, in 1877 of Mauritius, in 1882 Governor of Western Australia, and in 1891 of Trinidad. He was knighted in 1877. He died 26th Nov. 1896.

Broomrape. See OROBANCHEÆ.

Brora Beds are a series of strata occurring at Brora, a village in Sutherlandshire, of the same age as the Inferior Oolite of Yorkshire. They are chiefly remarkable for the occurrence in them of a seam of coal of good quality $3\frac{1}{2}$ feet thick, being the thickest stratum of true coal hitherto discovered in any secondary strata in Britain.

Brose (Gaelic *brothas*), a dish sometimes used in Scotland, made by pouring boiling water, milk, or the liquor in which meat has been boiled, on oatmeal, and mixing the ingredients by immediate stirring. Butter may be added, and sweet milk when the brose is made with water. It is *kail-brose*, *water-brose*, or *beef-brose*, according to the liquid used. *Athole-brose*, a famous Highland cordial, is a compound of honey and whisky.

Broseley, a small town of Shropshire, on the Severn, now a ward of the borough of Wenlock, famous for its manufacture of excellent clay tobacco-pipes. Its 'churchwardens,' or long clay pipes, are in request all over England.

Brosses, CHARLES DE, historian, was born at Dijon in 1709, and died president of the parliament of Burgundy, 7th May 1777. Among his works were *Lettres sur Herculaneum* (1750); *Histoire des Navigations aux Terres Australes* (1756), in which he introduced the name Polynesia; *Du Culte des Dieux Fétiches* (1760), the word *fetich* being first used by him in the sense now usual; the ingenious *Traité de la Formation Mécanique des Langues* (1765); and *Histoire de la République Romaine* (1777). His *Lettres écrites d'Italie en 1739-40* was edited by Colomb in 1835. See Marnet, *Le Président de Brosses* (1875).

Broth is an infusion or decoction of vegetable and animal substances in water. It is customary to use more or less meat, ox-flesh or mutton, with bone, and certain vegetables, as cabbage, greens, turnips, carrots, pease, beans, onions, &c. The whole are mixed together in cold water, heat slowly applied, and the materials allowed to simmer for some hours. The meat yields up certain ingredients, whilst others are retained in the residual flesh. Flesh heated with water yields to the water albuminous matter, gelatin, kreatin, extractive matters, lactic acid, salts, fat, saccharine matter; and leaves in the boiled meat fibrin, coagulated albu-

men, gelatinous tissue, fat, nervous matter. The vegetables yield albuminous constituents, colouring and mucilaginous matter, and volatile oils and salts. The real nutritive material present in broth is less than is generally thought, though it aids in satisfying the cravings of the appetite, and acts to a certain extent as a mild stimulant. See SOUP, BEEF-TEA.

Brothels, LAW AS TO. See NUISANCE, PROSTITUTION.

Brotherhoods, RELIGIOUS, were societies instituted for pious and benevolent purposes, and were numerous in the middle ages. Where the rules of monastic life appeared too narrow and severe, the Catholic Church favoured a freer form of consecrated life without vows other than that of devotion to good works or penitential exercises, but in many other respects, as in living together and the like, resembling the spiritual orders. Such brotherhoods or confraternities were, in earlier times, those of Mary, of the Scapular, and of the Rosary; in later times, that of the Sacred and Immaculate Heart of Mary for the conversion of sinners, that of Francis Xavier or the Mission Brotherhood, and that of Christian Learning (*Frères ignorants*) for the education of the people. The bridge-building brotherhood (*Fratres Pontifices*) originated in Southern France towards the end of the 12th century, and was recognised by Pope Clement in 1189. Their occupation was to keep up hospices at the most frequented fords of great rivers, maintain ferries, and build bridges. Other brotherhoods were the Familiars and Cross-bearers of the Inquisition in Spain, and the *Fratres Calendarii* in North Germany and the Netherlands. The great brotherhood of Common Life was founded about 1376 by Geert Groote (born 1340; died 1384) and Florentius Radevin (born 1350; died 1400) at Deventer. Its members were sometimes styled Brethren of Good Will, also Hieronymites and Gregorians, from Hieronymus and Gregory the Great, whom they claimed as patrons. Community of goods, ascetic habits, industry, and the use of the vernacular language in divine service, were some of the chief points insisted on by the brethren who were not fettered by monastic or any other vows. Their principal occupations were the copying of the Bible and other books for the common purse, prayer, and the instruction of the young, and their services in the last direction can hardly be overestimated. Their most famous houses were those of Windesheim, near Deventer, and Agnetenberg, near Zwolle. They became numerous in the Netherlands and North Germany, but also spread themselves in Italy, Sicily, and Portugal, so that in 1430 they reckoned more than 130 societies. The last was founded in Cambrai in 1505. The most important and distinguished members of the society were Gerhard Zerbold of Zutphen, the famous Thomas-à-Kempis, and the learned Cardinal Nicholas Cusa.—Female societies of a similar character sprung up at the same time with those of the Brothers of Common Life. At the head of each was a superior or directress who was styled the *Martha*. See Kettlewell's *Thomas-à-Kempis and the Brothers of Common Life* (2 vols. 1882).

They were usually founded at first without ecclesiastical authorisation, on account of which several of the confraternities that either did not seek or did not obtain the recognition of the church, assumed the character of sects, and were suspected of heresy. To this class, among others, belonged the Beghards and Beguines (q.v.), the Brothers and Sisters of the Free Spirit, the Apostolic Brethren (q.v.), the Flagellants (q.v.), who, tolerated by the church for a while, at last incurred

its displeasure and were severely persecuted. See also CHRISTIAN BROTHERS and CHRISTIAN SCHOOLS. Among Protestants brotherhoods have been formed, as the Rauhes Haus, founded by Wichern at Hamburg in 1833; those formed by Father Ignatius and the Cowley Fathers at Oxford are Anglican brotherhoods. See BENSON. Several similar institutions for women exist within the Church of England. See SISTERHOODS.

Brothers, a name given to three isolated mountains near the coast of New South Wales, between Harrington Inlet to the south, and Port Macquarie to the north. They are valuable as landmarks.—The name is also common to several groups of small islands.

Brothers, LAY, an inferior class of monks, not in holy orders, but bound by monastic rules, and employed as servants in Monasteries (q.v.).

Brothers, RICHARD, a visionary and fanatic, was born at Placentia in Newfoundland in 1757, and in 1772 entered the British navy, which he quitted with a lieutenant's half-pay in 1789. Refusing, from conscientious scruples, to take the oath requisite to enable him to draw his half-pay, he was reduced to great distress, and ultimately placed in the workhouse. In 1793 he announced himself as the apostle of a new religion, 'the Nephew of the Almighty, and Prince of the Hebrews, appointed to lead them to the land of Canaan;' and in 1794 he published a book, *A Revealed Knowledge of the Prophecies and Times*. For claiming the crown as a descendant of David (King of Israel) and as prince of the world, he was committed in 1795 to Newgate, and thence soon transferred to a lunatic asylum. He was released in 1806. His disciples included Nathaniel Halhed the M.P. and orientalist, Sharp the engraver, and Finlayson, a lawyer from Fife, with whom he chiefly resided from 1815 till his death on 25th January 1824.

Brough. See BROCHS.

Brougham, HENRY, LORD BROUGHAM AND VAUX, was born in Edinburgh, 19th September 1778. His father, Mr Henry Brougham, was the descendant of an old Westmoreland family, and his mother, Eleanor Syme, a woman of great worth and beauty, was a niece of Robertson the historian. Brougham received his education at the High School and at the university of Edinburgh. He gave early promise of future ability, some scientific papers written by him at the age of eighteen finding admission to the Transactions of the Royal Society. In 1800 he was admitted to the Scottish bar; in 1802 he helped to found the *Edinburgh Review* (q.v.), to whose first twenty numbers he contributed eighty articles. His Liberal views shut him out from the hope of promotion in Scotland, and a character which he had acquired for eccentricity and indiscretion excluded him from all legal practice, except the unremunerative practice of the criminal courts. In 1805 he settled in London; in 1806 was for three months secretary to a mission to Lisbon; and in 1808 was called to the English bar.

In London he first made his mark at the bar of the House of Commons as counsel for the Liverpool merchants who petitioned against the Orders in Council. Shortly after, in 1810, he entered parliament, and four months later brought in and carried his first public measure—an act making participation in the slave-trade felony. He was welcomed by the opposition leaders, to whose party he had attached himself, as a most powerful assistant in their attacks upon the government. In 1812 he succeeded in carrying the repeal of the obnoxious Orders in Council, and then ventured to contest the membership for Liverpool against Canning. He was defeated, and remained without

a seat till 1816, when he was returned for Winchester, and again became an active member of the opposition. By this time he had also established some reputation in the courts of law. He never, indeed, acquired a very large practice, but he repeatedly distinguished himself by speeches of great vigour and ability in the defence of persons prosecuted for libel by the crown. His most famous appearance as an advocate, however, was in defence of Queen Caroline (1820). His eloquence and boldness, though they forfeited for him the favour of the crown, gained him that of the people, and for the ten years between 1820 and 1830 Brougham was the popular idol. He made no bad use of his power. In 1822 he used it, though in vain, in support of a scheme of national education; and to his activity was due, in great measure, the establishment of the London University, of the first Mechanics' Institute, and of the Society for the Diffusion of Useful Knowledge. In 1830 he delivered a powerful speech against slavery, and in consequence of it—so he himself believed—was invited to stand, and returned, as member for the great popular constituency of the county of York. The aristocratically disposed Whigs would, had they dared, have excluded Brougham from the Reform ministry; but, in addition to his enormous popularity, he was virtually their leader in debate in the Commons, and thus, in spite of his unmanageableness, was indispensable. After various intrigues he was offered, and was persuaded, to accept a peerage and the chancellorship. He took his seat in the Lords in November 1830, and assisted materially in carrying the Reform Bill through that house. But his arrogance, self-confidence, and eccentricities, which sometimes verged on insanity, rendered him as unpopular with his colleagues as he was on the bench. He went out with the Whig government in 1834, and on its reconstruction five months later, found himself quietly shelved. He never held office again, never thenceforth exerted any appreciable influence on any great political movement, though still as before he continued to forward every measure for social progress, and was founder of the Social Science Association (1857).

It is as a law-reformer that Brougham will be best remembered. He took up Romilly's uncompleted task of carrying into practice the ameliorations suggested by Bentham. His efforts in this direction began as early as 1816, when he introduced into parliament a bill to remove various defects in the law of libel. In 1827, in a memorable six hours' speech, he enumerated the defects in nearly every branch of English law, and made proposals for dealing with law-reform on a proper scale. These, as might have been expected, met with little encouragement. It has been the fortune of many of his measures to be carried afterwards, in a mutilated form, by other hands. After he left office, Brougham also succeeded in carrying various reforms in the law, among which may be noted some very extensive changes in the law of evidence. His acts and bills, as well as those regarding the slave-trade, education, and other public questions, as those touching on law-reform, were collected and published by Sir J. E. Eardley Wilmot (1857). The large volume they form is the most fitting monument that could be preserved of the activity, perseverance, and public spirit of the man.

As an orator, more especially as a debater in parliament, Brougham was, among the men of his time, inferior only to Canning. He was wont, however, to indulge in his speeches in too large an admixture of exciting elements; argument was mingled with fiery declamation; ridicule,

sarcasm, invective, were freely used; and these he dealt out with a vehemence and energy that at times carried him far beyond bounds. The power of ready, rapid, and forcible diction was pre-eminently his. In many other fields besides oratory he won a high reputation. He cultivated mathematical and physical science, and ventured upon the domains of metaphysics, history, theology, even romance. His miscellaneous writings are upon an almost incredible variety of subjects, and, numbering 133, fill 11 vols. in the collected edition (1855-61; 2d ed. 1873). They were, however, intended more to serve purposes of the moment, than as permanent additions to our literature; and though they display great powers of rapid comprehension and nervous clear exposition, it cannot be said that we are indebted to their author for any new truths in politics or morals, or any original discoveries in science.

While not engaged in parliament, Brougham chiefly resided at Cannes, in the south of France, where he had built a château in 1835, and where he died 7th May 1868. Two daughters had long predeceased him, and the title passed to his brother William (1795-1886). Brougham's memoir of his own Life and Times (3 vols. 1871) was written in extreme old age, and is very untrustworthy. Peacock hit him off well in *Crotchet Castle* as 'the learned friend'; and Rogers remarked of him, as he once was leaving Panshanger, 'There goes Solon, Lyeurgus, Demosthenes, Archimedes, Sir Isaac Newton, Lord Chesterfield, and a great many more in one post-chaise.' O'Connell's gibe was less kindly: 'If Brougham knew a little of law, he would know a little of everything.' See Atlay's *Victorian Chancellors* (vol. i. 1906).

Broughton, LORD. See HOBHOUSE (J. C.).

Broughton, RHODA (1840-1920), the daughter of a clergyman, made a name for herself by her novel *Not Wisely but Too Well* (1867). Others are *Cometh up as a Flower* (1867), *Red as a Rose is She* (1870), *Nancy* (1873), *Joan* (1876), *Belinda* (1883), *Doctor Cupid* (1886), *Alas!* (1890), *A Beginner* (1894), *Scylla and Charybdis* (1895), *Dear Faustina* (1897), *The Game and the Candle* (1899). Her later works are not her best. Her plots are usually but ill constructed, her cynicism is shallow and unreal, and her stories too often contain equivocal situations unjustified by dramatic necessity; but the work shows a vigorous individuality, and the style is clever and graphic, though too often marred by a vulgarity that seems in grain. 'In Miss Broughton's determination not to be mawkish or missish,' says Mr Trollope, 'she has made her ladies do and say things which ladies would not do and say.' Her heroines need not be so often plain, so often extravagantly worship or detest their parents, nor take such an unconscionable time in dying; while her abuse of italics and the present tense are devices that are merely monotonous, and add no strength to the work of so clever a writer.

Broughty-Ferry, a town of Forfarshire, on the Firth of Tay, absorbed in 1913 by Dundee. It is connected with Tayport, in Fife, by a railway-ferry over the firth, here a mile broad, which, before the opening of the Tay Bridge, to the westward, formed the chief means of approach from Edinburgh and Fife to Dundee. Many Dundee merchants occupy fine villas at Broughty-Ferry, and it enjoys all the amenities of a favourite watering-place. On the shore stands a castle, which, built in 1498, was held by the English 1547-50. In 1860-61 it was repaired as a defence for the Tay. Pop. (1861) 3513; (1891) 9256; (1911) 11,058.

Broussa, BRUSA, or BOURSIA, the ancient *Prusa*, where the kings of Bithynia usually resided, situated in Asiatic Turkey, at the foot of Mount

Olympus, in Asia Minor, some 20 miles by rail SE. of its port Mudania on the Sea of Marmora. The town is beautifully situated, facing a luxuriant plain. Water flows down the centre of some of the streets, which are clean, but for the most part narrow and dark, and the bazaars very good. It contains about 200 mosques, some of which are very fine buildings, also three Greek churches, an Armenian and several synagogues. The old citadel stands on a rock in the centre of the town. Both Greeks and Armenians have an archbishop here. The silks of Broussa are much esteemed, but the production of the silk-factories, many of which are in the hands of Europeans, has fallen off. Wine is largely produced by the Greeks, and fruit is exported; carpets and tapestry are also made. As capital of a vilayet (often called Khodavendighiar), Broussa is the official residence of a Turkish pasha, and the seat of a Turkish tribunal. Broussa is subject to frequent earthquakes. In ancient times it was famous for its thermal baths, which are still much esteemed; they are sulphurous, and spring out of the flank of Mount Olympus. During the terrible earthquakes of 1855, they ceased for a time to flow, but soon returned with a fuller current than before. Meerschaaum clay is also obtained from a hill in the vicinity. Prusa is said to have been built by Prusias, king of Bithynia. It was plundered by the Saracens in 950, but retaken and fortified. The sultan Othman besieged it in 1317; and in 1327 his son Orkhan, the second emperor of Turkey, captured it, and made it the capital of his empire, and it continued so until the taking of Constantinople by Mohammed II. in 1453. The first six sultans of the Ottoman empire are buried here. Ibrahim Pasha occupied the city in 1833; Abd-el-Kader found refuge here from 1852-55. The population is about 100,000. After the Great War the district was held by the Greeks till 1922.

Broussais, FRANÇOIS JOSEPH VICTOR, the founder of a theory of medicine, was born at St Malo, 1772, and served as a surgeon in the navy and army. In 1820 he was appointed professor at the military hospital of Val-de-Grace. In 1830 he became professor of General Pathology in the Academy of Medicine in Paris, and afterwards was made a member of the Institute. He died at Vitry in 1838. His peculiar views are fully explained in his chief work—the *Examen de la Doctrine Médicale Généralement Adoptée* (1816), which asserts the following principles: that life is sustained only by excitation or irritation; that this excitation may be either too strong (*surexcitation*) or too weak (*adynamie*). These abnormal conditions at first manifest themselves in a specific organ of the body, but afterwards, by sympathy, are extended to other organs, as in fever—i.e. all diseases are originally *local*, and become *general* only by sympathy of the several organs. His theory and practice, which strongly resemble the Brunonian system of John Brown (q.v.), gained many adherents in France, who took the name of the 'Physiological School.'

Broussonetia. See MULBERRY.

Brouwer (sometimes written BRAUWER), ADRIAN, a Dutch painter, was born at Oudenarde (now in Belgium) in 1605 or 1606, of extremely poor parents, studied at Haarlem under Franz Hals, and about 1630 settled at Antwerp. Here, under the influence of Rubens, who thought highly of him, he attained to great brilliancy of colour; and from the beginning he had shown great power of strong and graphic characterisation. His favourite subjects were scenes from tavern life, country merrymakings, card-players, smoking and drinking groups, and roisterers generally. His life

was dissipated and embarrassed by debt; and he died of the plague in an Antwerp hospital in 1638, not yet thirty-three years of age. His influence was marked on Teniers the younger, Van Ostade, and others. His best pictures are at Munich, St Petersburg, Madrid, Dresden, and Vienna. See *Lives* by Schmidt (Leip. 1873) and Bode (Vienna, 1884).

Brown, MOUNT, in the Rocky Mountains, near the source of the Columbia River, and on the borders of British Columbia and Alberta, is 9000 feet high.

Brown, CHARLES BROCKDEN, an American novelist, of Quaker ancestry, was born at Philadelphia, January 17, 1771. After abortive studies in law he adopted literature as a profession, the first American to do so. *Wieland* (1798), the earliest of his fictions, was followed in 1799 by *Ormund*, or *the Secret Witness*, in which the character of Constantia Dudley was greatly admired by Shelley. Other novels were: *Arthur Mervyn*, or *Memoirs of the Year 1793*—the fatal year of yellow-fever in Philadelphia; *Edgar Huntly*, or *the Adventures of a Sleep-walker* (1801); *Clara Howard* (1801); and *Jane Talbot* (1804). He died of consumption, February 22, 1810. Brown had great imaginative and psychological ingenuity. He invents incidents and analyses feelings with remarkable subtlety, but his success is marred by lack of reality and extravagance. As a novelist he owed much to Godwin. A Life of Brown by W. Dunlap was prefixed to the edition of his novels in 7 vols. (Boston, 1827); there is another edition in 6 vols. (Philadelphia, 1857); reissued, 1887). See Life by W. H. Prescott (1834).

Brown, FORD MADOX, historical painter, one of the most intellectual, forcible, and unconventional artists of his time, grandson of the founder of the Brunonian system of medicine, was born at Calais in 1821. His earlier studies were conducted mainly at Antwerp, under Baron Wappers, who, in his turn, had been influenced by the Romantic school of France; and, after a brief period spent in portrait-painting in England, he resided for three years in Paris, where he produced his 'Manfred on the Jungfrau' (1841), and 'Parisina's Sleep' (1842), works intensely dramatic in feeling, but sombre in colouring. In 1844-45 he contributed three subjects to the Westminster cartoon competitions, preliminary to the mural decoration of the Houses of Parliament, works praised by Haydon, though they gained no prize; and one of them was carried out in 1861 as an oil-picture, titled 'Willelmus Conquistator,' one of the most dignified and monumental of the artist's productions. A visit to Italy about 1845 led him to seek greater variety and richness of colouring, and its results were seen in 'Wyclif reading his Translation of the Scriptures to John of Gaunt' (1848), and 'Chaucer reciting his Poetry at the Court of Edward III.' (1851). Already his art had been developing new aims, which demanded fresh methods for their expression; and gradually he formed a style characterised by great originality, force, and directness, much in harmony with that of the Pre-Raphaelites, and, in point of time, anticipating their efforts. In 1850 he was a contributor of verse, prose, and design to the Pre-Raphaelite magazine the *Germ*, and in his youth Rossetti worked in his studio. Among the most important works in his fully developed manner are 'Cordelia and Lear,' 'Christ washing Peter's Feet,' 'Work,' 'The Last of England,' 'Romeo and Juliet,' 'The Entombment,' 'Cromwell dictating the Vaudois Despatch to Milton,' and, in landscape, the 'English Summer Afternoon.' In 1865 he held an exhibition of his collected works in London, the interesting and valuable descriptive catalogue of which was written by himself. He was known to

some extent as a book-illustrator, and among his designs for stained glass are the windows of St Oswald's, Durham. From 1879 till a few months before his death—which took place on the 6th October 1893—he was engaged upon a great series of twelve subjects from local history for the town-hall of Manchester. They are executed by the Gambier-Parry process, the earlier works being painted directly upon the prepared surface of the walls, and some of the later upon canvas.—His son, OLIVER MADOX BROWN, author and artist, was born at Finchley, 20th January 1855. At the age of twelve he executed a water-colour subject—'Margaret of Anjou and the Robber'—of very considerable merit; two years later his 'Chiron' was shown at the Dudley Exhibition; in 1870 his equestrian 'Exercise' found a place on the line in the Royal Academy; and already two of his designs, 'The Deformed Transformed' and 'Mazeppa,' had been engraved. In 1871-72 he wrote his first novel, published in an altered and mutilated form in 1873, under the title of *Gabriel Denver*, and reprinted in original form and under its first title of *The Black Swan* in his *Literary Remains* (1876). As the work of a lad under seventeen, it is a marvellous production. The tales of *The Duval*, *Bluth* and *Hebditch's Legacy*, with some minor narrative pieces, were left incomplete at the time of their author's death. As a poet he was no less precocious. At the age of fourteen he had written several remarkable sonnets; and from time to time he produced lyrics and other fragments in which the dominant note is that same passionate intensity which is the main characteristic of his fiction. His promising career was cut short; he died of blood-poisoning on the 5th November 1874.

See a life of the father by Ford Madox Hueffer (1893), and of the son by J. H. Ingram (1883).

Brown, SIR GEORGE, British general, was born at Linkwood, near Elgin, in 1790, and entered the army in 1806. He served through the Peninsular campaign (1808-13), and in 1814 joining Ross's expedition against the United States, was wounded at the battle of Bladensburg, and obtained his lieutenant-colonelcy. In the Crimean war (1854-55) he commanded the Light Division, and was severely wounded at Inkermann. In 1855 he was created a G.C.B., and in 1856 was gazetted 'General for distinguished service in the field.' In 1860 he became commander-in-chief in Ireland, and he died at Linkwood, 27th August 1865.

Brown, GEORGE LORING, American artist, born in Boston, 2d February 1814, spent more than twenty years in the art-centres of Europe, and returned to America in 1860 with a high reputation as a landscape-painter. His works include American and Italian landscapes of considerable merit, among the more important being 'The Crown of New England' (1861), 'Niagara by Moonlight' (1876), and Venetian scenes. He died 25th June 1889.

Brown, HENRY KIRKE, sculptor, born at Leyden, Massachusetts, in 1814. He studied for some years in Italy, and returning in 1846, settled at Brooklyn, where he executed the first bronze statue ever cast in America. Besides several subjects in marble, his notable works include statues of Lincoln in Brooklyn and New York, an equestrian statue of General Scott in Washington, and a colossal equestrian statue of General Washington in Union Square, New York. He died July 10, 1886.

Brown, JOHN, of Haddington, author of the *Self-interpreting Bible*, was born in 1722 at Carpow, near Abernethy, Perthshire. A poor weaver's child, at the age of eleven he lost both father and mother, and himself shortly afterwards all but died

of four fevers. His schooling was scanty; but, as a herd-boy on the Tayside hills, he studied Greek, Latin, and Hebrew with such success that the neighbours declared he had dealings with the evil one. Once, after folding his flock, he set off for St Andrews, 24 miles away, and stood the next morning in a bookseller's shop, inquiring the price of a Greek Testament. The man laughed at him; but a professor, who was in, said he would give him one if he could read a verse. Ay, could he; and so the Testament was his. Then he turned pedlar, a pedlar like him in Wordsworth's *Excursion*; during the '45 served in the Fife militia; and from 1747 to 1750 was a schoolmaster at Gairney Bridge, near Kinross, and at the Spittal, near Penicuik. The vacations were devoted to theological study in connection with the Associate Burgher Synod; and in 1751, having the year before been licensed to preach, he was called to the congregation at Haddington. He was a man of great learning, knowing Latin, Greek, Hebrew, Arabic, Syriac, Persian, and Ethiopic, French, Spanish, Dutch, German, and Italian; open-handed, on a stipend of from £40 to £50 a year; not narrow-minded, the age and his station considered; a kindly humorist, though harrowing self-doubts tormented him all his life through; and a powerful preacher, witness David Hume's well-known remark: 'That's the man for me, he means what he says; he speaks as if Jesus Christ was at his elbow.' In 1768 he accepted the unsalaried Burgher chair of Divinity; in 1784 he refused the pastorate of the Dutch Church at New York; and on 19th June 1787 he died at Haddington. Of his twenty-seven ponderous works, published between 1758 and 1804, and dealing with the Scriptures, church history, &c., the most widely known are the *Dictionary of the Bible* (1768) and the *Self-interpreting Bible* (2 vols. 1778), whose object was 'to condense within a reasonable space all the information which the ordinary reader may find necessary for attaining an intelligent and practical knowledge of the sacred oracles.' See his *Memoirs and Select Remains*, edited by the Rev. W. Brown (Edin. 1856).

JOHN BROWN, D.D., his grandson, was son of the Rev. John Brown of Whitburn (1754-1832), and nephew to the Rev. Ebenezer Brown of Inverkeithing, whose eloquence amazed Brougham and Jeffrey. Born in 1784, he studied at Edinburgh University from 1797 to 1800, and then, not yet sixteen years old, left home with his father's blessing and a guinea, to keep school for three years at Elie, meantime attending, during the summer vacations, the Burgher Theological Hall at Selkirk. In 1806 he was ordained to a pastorate at Biggar; in 1822 accepted a call to Rose Street Church, Edinburgh; and thence in 1829 was translated to Broughton Place. Created a D.D. of Jefferson College, Pennsylvania, in 1830, he was elected professor of Exegetical Theology in 1834; during 1840-45 was engaged in the vexatious atonement controversy; and died 13th October 1858. He published close upon twenty religious works; but for us the interest is in the man himself, strong, saintly, learned, yet with a passion for riding, and 'a steady liking, nay hunger, for a good novel.' See Dr Cairns's Memoir of him (1860), and especially the letter, appended thereto, by his son.

That son, DR JOHN BROWN, the essayist, was born at Biggar, 22d September 1810. Till 1822 his education was undertaken by his father, who had lost his first wife in 1816; then, when the family removed to Edinburgh, the boy had four years at a classical academy and the High School. In 1826 he entered on the arts course at the university, and in 1828 on the medical, at the same time becoming pupil and apprentice to Syme, the eminent surgeon. In 1833, after a year spent at Chatham

—the great cholera year—as a surgeon's assistant, he graduated M.D., and at once established a practice in Edinburgh. It never was large, for he was something besides a doctor, and nothing at all of a money-getter. His life was quiet and uneventful, save that its latter years, all but the last one, were clouded by fits of the darkest depression. The end came somewhat suddenly, but sweetly, on 11th May 1882. He is buried beside his father in the New Calton Cemetery. Almost all Dr John Brown's writings are comprised within three volumes—the two *Horæ Subsecivæ* ('leisure hours,' 1858-61), and *John Leech and other Papers* (1882). Editors and publishers had to 'pester' him to write, for he was distrustful, as few men, of his powers, believing that none should venture to publish aught 'unless he has something to say, and has done his best to say it aright. Herein lay the secret of his writing so little, and of that little's hyper-excellence. Dogs, children, old-world folk, friends gone before, and lowland landscapes—these are the subjects which he wrote on best; his essays on art and medical topics are good, but it is not by them that he will be remembered. Humour is the chief feature of his genius—humour with its twin-sister pathos; we find them both at their highest perfection in his sketches of 'Rab' and 'Marjorie'—the uncouth mastiff and the dear dead child. Then, silent Minchmoor, the Enterkin's wild pass, and peaceful Inchmahome—he is to them what Wordsworth is to Yarrow; himself to Yarrow he applied that most exquisite epithet, 'fabulosus as ever Hydaspes.' Writing of nothing that he did not know, he wrote, too, of nothing that he did not love, or at least did not greatly care for. Hence both the lucidity and the tenderness of his essays. They rank with Lamb's, and with Lamb's alone in the language. See Swinburne's Sonnet; *John Brown and his Sister Isabella*; *Peddle's Recollections* of him; J. T. Brown's Life of him (1903); and his own Letters (edited 1907).

SAMUEL BROWN, M.D., chemist, was a grandson of John Brown of Haddington, and son of Samuel Brown, provost of that burgh (1779-1839), who in 1817 established the East Lothian itinerating libraries. Born in 1817 at Haddington, he was educated there till 1830, when he entered the Edinburgh High School. Thence in 1832 he passed on as a medical student to the university, and, after a visit to St Petersburg (1837-38), graduated M.D. in 1839, but immediately surrendered himself to the fascination of chemistry. The dream of his life was the possibility of reconstructing the whole science of atomics, and to its experimental realisation he devoted his nights and days with all the self-forgetful ardour of the medieval alchemist. In 1843 he delivered in Edinburgh four memorable lectures on the atomic theory, but in the same year was unsuccessful in his candidature for the chair of Chemistry. His noble sincerity of nature, his subtlety and versatility of intellect, and his brilliant conversational powers endeared him to a group of friends that included such figures as Edward Forbes, De Quincey, Jeffrey, Carlyle, Harriet Martineau, and Emerson. For some years his health was uncertain, and he died at Edinburgh, 20th September 1856. He was author of the *Tragedy of Galileo* (1850), a monograph on his father (1856), and two admirable volumes of *Essays, Scientific and Literary* (1858), on Chemistry, Nature and Man, Christianity, George Herbert, David Scott, Physical Puritanism, Magnetism, Ghosts, &c. See *North British Review*, Feb. 1857.

Brown, JOHN, M.D., founder of the Brunonian system of medicine, born in 1736, of poor parents, in Bunkle parish, Berwickshire, was educated at the grammar-school of Duns. At school he was looked upon as a prodigy, his physical powers were great,

he possessed strong intelligence, and an extraordinary memory. After acting as teacher and tutor in Duns and Edinburgh, he obtained leave from Monro, professor of Anatomy, and the other professors, to attend their lectures free; meanwhile he was tutor to the children of the celebrated Dr Cullen, and became his assistant in his university lectures. Conceiving himself slighted by Cullen, he commenced giving lectures himself upon a new system of medicine, according to which all diseases are divided into the sthenic, or those depending on an excess of excitement, and the asthenic, those resulting from a deficiency of it; the former to be removed by debilitating medicines, as opium, and the latter by stimulants, such as wine and brandy. His system, in which he freely exposed the errors of former systems, and those of Dr Cullen, gave rise to much opposition, but his partisans were numerous; for a time his opinions had some influence, and what was true in his lectures has been gradually adopted in ordinary medical treatment. In 1779 he took the degree of M.D. at the university of St Andrews, and in 1780 published his *Elementa Medicinæ*. He was noted for the freedom with which he wrote and spoke Latin. A Life by Dr Beddoes of Bristol was prefixed to the second edition (2 vols. 1795) of Brown's own English translation. The book was reprinted on the Continent and in America, and translated into French, Italian, and German. He also wrote *On the Present System of Spasm as Taught in the University of Edinburgh* (1787), and a *Short Account of the Old Method of Cure*. Being overwhelmed with debt, for which he was at one time thrown into prison, in 1786 he removed to London, where he was again in difficulties. Just as his prospects had begun to brighten, and as he had arranged with a publisher to produce a work on gout for £500, with literary work mapped out for ten years to come, he was struck down by apoplexy, of which he died, 17th October 1788. His works were edited, with a memoir by his son, Dr William Cullen Brown (3 vols. 1804). The merits and demerits of the Brunonian system continued to be matter of controversy both in Europe and the colonies long after the death of its founder. Vol. ii. of Thomson's *Life of Cullen* (1859) is largely occupied with a discussion of the system; and Hirschel published, in German, a *History of the Brunonian System* (1846).

Brown, JOHN, of Ossawatomie, an American abolitionist of the most extreme type, was born at Torrington in Connecticut on the 9th May 1800. Descended in the sixth generation from Peter Brown, one of the *Mayflower* pilgrims, he preserved the stern religious enthusiasm of his ancestors. In 1805 his father, Owen, removed to Hudson, Ohio, and in 1812 had a contract to supply Hull's army with beef. John, already a vigorous lad, accompanied his father to Detroit, and acquired a hatred of both war and slavery. He became a tanner and land-surveyor, and from 1825 to 1835 lived at Richmond, Pennsylvania, where he was made postmaster. Returning to Ohio he engaged in land speculations, which proved disastrous, and then turned shepherd. In 1846 he removed to Massachusetts, but in 1848 purchased a farm at North Elba, New York. He wandered much through the country in prosecution of anti-slavery enterprises, in which he was assisted by his family. He was twice married and had twenty children. In 1854 five of his sons removed from Ohio to Kansas, and he joined them in the next year after the border conflict had begun. Brown became a leader in the strife, and two of his sons were arrested by United States cavalry. Soon after the town of Lawrence was sacked by border ruffians, he ordered five pro-slavery men at Pottawatomie to be slain as dangerous. Ossawatomie

Brown's home, was burned August 30, 1856, and his son killed. When the war in Kansas ceased, Brown began to drill men in Iowa, using rifles which had been sent to him from Massachusetts. His scheme then was to establish a stronghold in the mountains of Virginia as a refuge for runaway slaves. This plan was disapproved by the few to whom he mentioned it, and he resumed anti-slavery work in Southern Kansas. In June 1859 he hired a farm near Harper's Ferry, and here gathered twenty-two men, of whom six were coloured. Boxes of rifles, pistols, and pikes were also received. On Sunday night, October 16, with eighteen men, he broke into the United States armoury in the town and took several citizens prisoners. On Monday some fighting took place, and Colonel Robert E. Lee, with a company of marines, arrived from Washington. Lieutenant J. E. B. Stuart, who accompanied them, recognised Brown, whom he had met in Kansas. Brown, with six men, now driven into the engine-house, refused to surrender, and continued to fight until his two sons were killed and himself severely wounded. Brown was tried by a Virginia court for conspiracy to produce insurrection, for treason, and for murder. He was convicted and hanged at Charlestown, Virginia, December 2, 1859, having shown the utmost firmness throughout his imprisonment. Four of his men were executed with him, and two others later; six escaped. The raid was investigated by a committee of the United States senate. Its full effects were not seen until the civil war was over.

See Lives by Redpath (1860), Sanborn (1885), Chamberlain (1900), and—especially—Villard (1910).

Brown, ROBERT, an eminent botanist, the son of an Episcopal clergyman, was born at Montrose, Scotland, December 21, 1773, and educated there and at Marischal College, Aberdeen. While a student of medicine at the university of Edinburgh, he evinced a strong taste for botanical studies. He became, in 1795, ensign and assistant-surgeon in a Scottish Fencible regiment, with which he went to Ireland. In 1798 he visited London, and was introduced to Sir Joseph Banks, who gave him the free use of his collections and library. Devoting himself to the study of botany, he resigned his commissions in 1800, and the following year was, on the recommendation of Sir Joseph Banks, engaged as naturalist in the expedition sent out under Captain Flinders for the survey of the Australian coasts. On his return in 1805 he brought home nearly four thousand species of Australian plants, a large proportion of which were new to science. Soon after, he was elected an associate and appointed librarian to the Linnean Society. To the *Transactions* of the Edinburgh Wernerian Society, and those of the Linnean Society, he contributed memoirs on *Asclepiadaceæ* and *Proteaceæ*, and published *Prodromus Floræ Novæ Hollandiæ et Insulæ Van Diemen*. He also wrote on the botany of Flinders's expedition (1814). His adoption of the natural system of Jussieu led to its general substitution in place of the Linnean method. He observed the vibratory 'Brownian Movements' of microscopic particles, vegetable or mineral, when suspended in water. They are distinguished from the movements of active microscopic germs, having no movement of translation; and Stanley Jevons showed that the *diapedesis*, as he called it, varied greatly as the surface tension of the fluid was modified by substances in solution. As keeper of the Banks library and collections, Brown was made keeper of the botanical department of the British Museum when in 1827 the Banks collections were transferred thither. F.R.S. (1811), D.C.L. (1832), and according to A. von Humboldt 'facile princeps botanicorum', he was from 1833 one of the foreign

associates of the Academy of Sciences of the Institute of France. In 1839 the Royal Society awarded him their Copley medal. Sir Robert Peel granted him a pension on the Civil List of £200 a year. He was president of the Linnean Society from 1849 to 1853. Darwin thought him 'chiefly remarkable for the minuteness of his observations, and their perfect accuracy. His knowledge was extraordinarily great; much of it died with him, however, owing to his morbid fear of committing himself to mistakes. Brown died in London, 10th June 1858. A translation of Brown's miscellaneous works was published in Germany in 1825-34. The Ray Society in 1866-68 reprinted his complete works, except the *Prodromus*, under the editorship of J. J. Bennett. See BOTANY.

Brown, THOMAS, a Scottish metaphysician, born in 1778 at the manse of Kirkmabreck, Kirkcudbrightshire, went to Edinburgh in 1792, and for several years attended the university, though without ever completing the arts curriculum. He began the study of the law, but shortly abandoned it for medicine, and became in 1806 the partner of Dr Gregory in his large practice. His strong bent, however, was for literature and philosophical speculation. At the age of twenty he had published a refutation of Darwin's *Zoonomia*, and he contributed at the outset to the *Edinburgh Review*. In 1804 appeared his essay on *Cause and Effect*, in which he holds that there is nothing in a cause but the fact of immediate and invariable antecedence to the change called its effect. Dugald Stewart, professor of Moral Philosophy in the university, being obliged, from bad health, to retire in 1810, Brown was appointed colleague and successor, which office he continued to discharge till his death during a visit to London, 2d April 1820. He was popular as a professor; and his *Lectures*, published after his death, reached its 19th edition in 1851, although the book has now fallen into neglect. He also wrote a good deal of rather indifferent poetry. Brown attempted to overturn the psychological system of his predecessors, Reid and Stewart, and to substitute a new and simplified scheme of mental phenomena, including a sixth or *muscular sense*.

Brown, THOMAS EDWARD (1830-97), son of a clergyman at Douglas in the Isle of Man, from Christ Church, Oxford, was elected a fellow of Oriel, and for thirty years (1863-92) was master at Clifton College. The rest of his life he spent in his beloved native island. Some of his lyrics are admirable; his notablest works were narrative poems in Manx English. *Betsy Lee* appeared in *Macmillan's Magazine* in 1873, and with other poems was included in *Fo'c's'le Yarns* (1881). Other collections were named from *The Doctor* (1887), *The Manx Witch* (1889), and *Old John* (1893); and all his poems were collected in one volume in 1900. See his Letters (2 vols. 1900), with memoir by Irwin.

Brown, TOM, 'of facetious memory' in Addison's phrase, was born at Shiffnal, Shropshire, in 1663. His studies at Christ Church, Oxford, were most probably cut short by his irregularities, but are remembered by his clever extempore translation and application to Dr Fell, the dean of Christ Church, of Martial's epigram, 'Non amo te, Sabidi': 'I do not love thee, Dr Fell, the reason why I cannot tell.' After a few years of teaching at Kingston-on-Thames, he settled in London, where he made an uncertain living by writing satirical poems and pamphlets, many of them remarkable more for their vigour and scurrility than their wit. He is principally interesting now as the assailant of much better men than himself, among them Dryden, Sherlock, Tom Durfey, and Sir Richard Blackmore. He lived a shifty and

disreputable life, and died 16th June 1704, being fittingly buried near his friend, Mrs Afra Behn. His works were collected into 3 vols. (1707-8).

Brown, SIR WILLIAM, founder of the Liverpool Free Library, was born at Ballymena, County Antrim, in 1784, and sailed in 1800 with his parents for Baltimore, U.S. Returning in 1809, he established at Liverpool a branch of his father's linen business, and laid the foundation of one of the largest mercantile firms in the world. A liberal reformer and able advocate of a decimal coinage, he took a prominent part in local and public affairs, and unceasingly promoted the education of the people. In 1844 he vainly contested South Lancashire, but was returned for it in 1846, and was thrice afterwards re-elected. In 1857, at a cost to himself of £40,000, he founded the Free Public Library of Liverpool, and in 1859 he raised a corps of volunteer artillery. He was made a baronet in 1863, and died 3d March 1864, leaving a fortune of £900,000 personalty.

Brown Coal. See LIGNITE.

Browne, CHARLES FARRAR, one of the most typical of American humorists, commonly known by his pseudonym 'Artemus Ward,' was born in Waterford, Maine, 26th April 1834. He began life as a printer and learned type-setting in the office of the *Skowhegan Clarion*, Maine, but soon removed to Boston, and thence to Toledo and Cleveland. Meantime he had become a reporter and contributor to the newspapers. In 1858, under the style of 'Artemus Ward, showman,' he wrote for the *Cleveland Plaindealer* a description of an imaginary travelling menagerie. This was followed by letters professedly from the same source, in which grotesque spelling and an inextricable interweaving of business puffery and moralising served to convey sound sense and shrewd satire. The letters were widely circulated, and the author was invited to a share in the editorship of a new comic paper, *Vanity Fair*, in New York. In the stress of war times the paper failed, after a brilliant career, and in December 1861 'Artemus Ward' entered the lecture field. Under the title, *The Babes in the Wood*, he delivered a telling satire on the dull twaddle which had been imposed on the public by pompous bores. Such was its success that a theatrical manager in California telegraphed to him, 'What will you take for forty nights in California? Answer immediately.' His prompt reply, 'Brandy-and-water,' assured him a welcome among the miners. Making his way thither by stage-coach over the plains and Rocky Mountains, 'Ward' had some experience with the Indians, and especially with the Mormons, 'whose religion,' he afterwards explained, 'is singular, but their wives are plural.' As an adjunct to his lectures on these attractive topics, he got a panorama, whose artistic wretchedness furnished occasion for countless jokes. In 1864 the lecturer was disabled by pulmonary consumption. In 1866, having rallied somewhat, he went to England, where he was received in the most friendly manner. He contributed to *Punch*, still in the character of 'the genial showman.' In November he opened the exhibition of his panorama in Egyptian Hall in London, and achieved great popularity as a representative of American humour. Though the seal of death was on his features, he did not abate any of his quaint originality and amusing satire. His keen observation and graphic revelation of human nature stood forth from a background of truisms, which removed for a time any suspicion that the satire was aimed at the audience. In February 1867 Browne went for the benefit of his health to the Isle of Jersey, but returned to die at Southampton, England, 6th March 1867. He was deeply beloved by his asso-

ciates, and tenderly devoted to his mother, to whom he left a modest competence.

His works were gathered into several volumes: *Artemus Ward, His Book*, &c. (1862-67); and M. D. Landon prefixed a Life to a collected edition (1875). His *Best Stories* were edited by Clifton Johnson in 1913.

Browne, EDWARD HAROLD, divine, was born 6th March 1811, at Morton House, Bucks, and educated at Eton, and at Emmanuel, Cambridge. He became fellow and tutor, professor of Hebrew at Lampeter (1841), and of Divinity at Cambridge (1854), Bishop of Ely (1864), and of Winchester (1873). His works comprise several volumes of sermons, a book on the Pentateuch, and the *Exposition of the Thirty-nine Articles* (1850; 13th ed. 1887). He died 17th December 1891. See his Life by Dean Kitchin (1895).

Browne, HABLOT KNIGHT, artist, the 'Phiz' of many clever and humorous book-illustrations, was born at Kennington, Surrey, 15th June 1815. He early showed a strong taste for drawing, and was apprenticed to Finden; but the laborious methods of line-engraving were little to his taste, and he took to the freer processes of etching and water-colour painting, and in 1833 gained a medal from the Society of Arts for an etching of 'John Gilpin.' In 1836 Browne succeeded Seymour and R. W. Buss as illustrator of Dickens's *Pickwick*, competing successfully against Thackeray for the work; and he soon enjoyed a reputation which was continued and preserved by his designs to *Nicholas Nickleby*, *Master Humphreys's Clock*, *Martin Chuzzlewit*, *Domby*, *David Copperfield*, *Bleak House*, *Little Dorrit*, and *A Tale of Two Cities*. He also illustrated many of Lever's and several of Ainsworth's novels. He laboured for thirty years with unceasing activity, save for occasional breaks during the hunting-season, and a little travel. In 1867 he was struck with paralysis; he died 8th July 1882. His younger son, Gordon Frederick Browne (b. 1858) is well known as a book-illustrator. See Life by D. C. Thomson (1884).

Browne, ROBERT, founder of the Brownists, was born about 1550 at Tolethorpe, Rutlandshire, and after graduating at Cambridge in 1572, was a schoolmaster in London, and an open-air preacher. In 1580 he began to attack the order and discipline of the Established Church, and soon after formed a distinct church on congregational principles at Norwich. Committed by Bishop Freaque to the custody of the sheriff, he was released through the influence of his kinsman, Lord Burghley; but in 1581, with his followers, was obliged to take refuge at Middelburg, in Holland. In 1584 he returned, *via* Scotland, to England, and reconciling himself to the Established Church, in 1586 became master of Stamford grammar-school, in 1591 rector of Achurch, Northamptonshire. Of a very violent temper, he was, when eighty years old, sent to Northampton jail for an assault on a constable, and in jail he died about 1633. The Brownists continued, notwithstanding their leader's defection, to subsist as a separate sect for some time both in Holland (among the English there) and in England. From Holland many of them sailed for America in 1670, the rest being absorbed in the Presbyterian Church in 1701; in England, they may be said to have given birth to the Independents or Congregationalists.

Browne, SIR THOMAS, author of the *Religio Medici*, was born in London, October 19, 1605, the son of a mercer of good family at Upton in Cheshire. His father died early, and his mother married again, leaving her son to the care of a rapacious guardian who seems to have made inroads upon his ward's fortune of £6000. He was educated at Winchester College and at Broadgate Hall (now

Pembroke College), Oxford, graduating B.A. in 1626 and M.A. in 1629. He next studied medicine, travelled in Ireland, France, and Italy, continued his medical studies at Montpellier and Padua, graduated as Doctor of Medicine at Leyden about 1633, and at Oxford in 1637, settling the same year at Norwich. He lived calmly throughout the troubles of the Civil War; maintained an active correspondence with some of the most learned antiquaries and scientists of his time, as Evelyn, Dugdale, Elias Ashmole, and Ray the naturalist; and was knighted by Charles II. on his visit to Norwich in 1671. He had married Dorothy Mileham in 1641, and his domestic letters that have been preserved give glimpses of a home-life of singular happiness. Of his twelve children, but one son and three daughters survived him. He died on the day on which he had completed his seventy-seventh year, 19th October 1682, and was buried in the church of St Peter's Mancroft, where his coffin was accidentally discovered by some workmen in 1840. The skull, which was well preserved, was 'knaw'd out of its grave' and placed in the hospital-museum—a 'tragical abomination' that the men of Norwich might well have spared their greatest citizen.

Sir Thomas Browne's greatest work is his earliest, the *Religio Medici*, written about 1635 at Shipden Hall near Halifax, after his return from his travels, when his life was still a 'miracle of thirty years.' He tells us in the preface that it was composed 'at leisurable hours' for his 'private exercise and satisfaction,' and that 'the intention was not publick.' Two surreptitious editions published in 1642 obliged the author to issue an authorised edition in 1643. The book did not need Sir Kenelm Digby's 'observations' to make it at once famous if not popular. It was translated into Latin, and had the honour to be inserted in the *Index Expurgatorius*. Certain passages gave rise to much undeserved misrepresentation of its author's religious opinions, although, as Dr Johnson says, 'it is no difficult task to replace him among the most zealous professors of Christianity.' The book indeed is a kind of confession of faith, though it is more of a contribution to piety than to faith. It is the spiritual self-revelation of a nature of rare beauty and attractiveness, and the sympathetic reader is startled by occasional passages that reveal a depth of insight into the dim mysteries of the spiritual life that seems as unconscious as it is unexpected. 'Wingy mysteries in divinity and airy subtleties in religion' had ever a strange charm for the speculative side of Browne's intellect. He loves to abandon his mind to a full sense of the mysterious in religion. 'There are not impossibilities enough,' he says, 'in religion for an active faith. . . . I love to lose myself in a mystery, to pursue my reason to an *O altitudo!*' The book, moreover, reveals a lofty toleration for conditions of life and opinion widely different from the author's own, and a rare width of spiritual sympathy, extending even to virtuous heathens and to those ceremonies which 'misguided zeal terms superstition.' It is startling to find such a sentence as the following in a seventeenth-century writer: 'Persecution is a bad and indirect way to plant religion. It hath been the unhappy method of angry devotion.' Unfortunately, the clear-sighted thinker was not in all points before his time. He makes avowal here of his belief in the existence of witches, and a pitiful commentary on this was his opinion given at the request of the Lord Chief-justice, Sir Matthew Hale, during the trial of two women for witchcraft at Bury St Edmunds in 1664, which doubtless helped to send the unhappy victims to their doom.

Sir Thomas Browne's next work was *Pseudo-*

doxia Epidemica, or Enquiries into very many received tenets and commonly presumed truths, which examined prove but Vulgar and Common Errors (1646), a strange amalgam of humour, acuteness, and credulity. Though by far the largest and most elaborate of his works, even it is entirely discursive and occasional; displaying, as it does, remarkable out-of-the-way learning, and lightened up by grave humour.

In 1658 appeared *Hydriotaphia; Urn Burial, or a Discourse of the Sepulchral Urns lately found in Norfolk; and The Garden of Cyrus, or the Quincuncial Lozenge, net-work Plantations of the Ancients, artificially, naturally, mystically considered*. The former is mainly an elaborate discussion of the burial-customs in various countries at various times, set in language of rich and gorgeous eloquence. The concluding chapter is a solemn homily on death and immortality. The *Garden of Cyrus* aims to show that the number five pervaded not only all the horticulture of antiquity, but that it recurs throughout all plant-life, as well as the 'figurations' of animals. All Browne's works are unsystematic and unequal; there is an unpremeditated desultoriness throughout that strikes an observant reader. His thought, no less than his style, is strikingly original, and is marked by high and occasionally transcendent intellectual power; often expressed with quaint humour or searching pathos, and always carrying with it a strange impressiveness. His favourite theme throughout all his books is ever the mystery of death and what lies beyond the grave. His style is peculiar, idiomatic, and difficult, and often falls into obscurity. He has never been equalled in the free coinage of Latinisms. No writer bears the impress of his influence more strongly than Charles Lamb. De Quincey ranked him with Jeremy Taylor as the richest and most dazzling of rhetoricians, and Lowell pronounced him 'our most imaginative mind since Shakespeare.'

There was a notable edition of Browne's works by Simon Wilkin (4 vols. 1835-36) in which appeared Dr Johnson's Life of Browne, with supplement by Wilkin; a later one by Charles Sayle (3 vols. 1904-7). Dr Greenhill's scholarly edition of the *Religio Medici* appeared in 1881, and the *Hydriotaphia* in 1896. Thomas Southwell edited *Notes and Letters on the Natural History of Norfolk, more especially on the Birds and Fishes* (1902), from Browne's MSS. in the Sloane Collection. Browne's will, and that of his father, were published by C. Williams (1906). The fullest bibliography of the *Religio Medici* is by C. Williams (1905). See also E. Gosse's *Sir Thomas Browne* (1905); A. Whyte's *Sir Thomas Browne: an Appreciation* (with selections from his writings, 1898); and Walter Pater's *Appreciations* (1889).

Browne, ULYSSES MAXIMILIAN, COUNT (1705-57), born at Basel of Irish Jacobite family, became one of the foremost field-marshal in the army of Maria Theresa. As governor of Silesia (1739-42) he had to face the first of Frederick the Great's attacks, and in the Seven Years' War he commanded the Austrians at Lobositz (1756). He was mortally wounded at the battle of Prague.

Browne, WILLIAM, English pastoral poet, was born at Tavistock in 1591. He had his education at Exeter College, Oxford, was next a student at the Inner Temple, then tutor to Robert Dormer, the future Earl of Carnarvon. According to Wood he was taken into the household of the Herberts at Wilton, where he 'got wealth and purchased an estate.' But little is known of his life. He was living at Dorking about the close of 1640, and seems to have died about 1643. His great work was *Britannia's Pastorals* (books i. ii. 1613-16; reprinted 1625). Browne here shows a fine descriptive faculty, and rich poetry gleams through his quaint and tedious allegorising. A

third book was printed by the Percy Society in 1852, and by W. C. Hazlitt in his collective edition of Browne's works for the Roxburghe Club (2 vols. 1868); which includes also *The Shepherd's Pipe* (1614), a collection of eclogues, a masque produced at the Inner Temple in 1615, sonnets, and 'visions' on the model of Du Bellay. The famous epitaph 'Underneath this sable hearse,' long attributed to Ben Jonson, seems to be really Browne's. Browne, ranked by some modern critics amongst the most delightful poets of the Elizabethan period, was an admirer and imitator of Spenser. He was studied by Milton, and is significant for his influence on Keats. An edition of his poems by Goodwin was published, with introduction by Mr Bullen, in two volumes of 'The Muses' Library,' in 1904.

Brownian Movements. See BROWN (ROBERT).

Brownie, in the folklore of Scotland, a good-humoured drudging goblin; see FAIRIES.

Browning, ELIZABETH BARRETT. See BROWNING, ROBERT.

Browning, OSCAR, born in London in 1837, was educated at Eton and at King's College, Cambridge, where in 1859 he became a Fellow. In 1860-75 he was a master at Eton; from 1876 he did college and university work at Cambridge, holding amongst other posts that of university lecturer in history. He has written much—on modern England, modern France, modern Europe, education and educational theories, Napoleon, the French Revolution, Guelphs and Ghibellines, the Condottieri, Peter the Great, Charles XII., Dante, Goethe, and George Eliot.

Browning, ROBERT, a great and in any case a unique poet, one who would be a curiosity of literature even if he were not a master of it, was personally a typical product of the 19th century and of the English middle-class. He was born of a comfortable family in Camberwell (which though more rural was even then suburban) on the 7th May 1812. His father was a clerk in the Bank of England; but his father's private quality was more important than his public; he was a man of no inconsiderable learning, and the poet, his son, was brought up to feed on books. His formal education was local and trivial, but his informal education must evidently have been rich and stimulating. This can be seen even in his first publications; *Pauline*, published in 1833, is the mosaic of a rich culture. And his second book, *Paracelsus* (1835), a study of one of the strange philosophers of the more mystical Renaissance, is just such a work as no young man would write unless he had grown familiar not only with literature but with the holes and corners of literature. *Paracelsus* is a noble analysis of the too intellectual idealist; it contains passages that might be put into the mouths of the most immortal artists or philosophers; it is quite typical of Browning and his upbringing that they are put by him into the mouth of a forgotten alchemist. His next two ventures in literature illustrate his standing difficulty: which was that while his taste was as romantic as a troubadour, his instinctive mode of expression sounded as involved as trigonometry. Urged by his friend Macready, he attempted success as a dramatist; and he ought to have gained it. There never was a man more vitally dramatic than Browning; he loved above all things abrupt reversal, transitions sudden and picturesque. A meditation by Browning is more full of action than a melodrama by almost anybody else. When the fine play of *Strafford* was produced in 1837 its comparative failure was not due to anything undramatic in its spirit; it was not the stale contemporary case of a languid poet

seeking in vain to adapt himself to the activities of the stage. On the contrary, a play by Browning is rather like a play played too fast than a play played too slow. This criticism applies even more vividly to those romantic and violent plays *The Return of the Druses* and *Colombe's Birthday* and *A Blot on the 'Scutcheon'*; and applies in another way to *Pippa Passes*. There is action enough in these things; the mental and moral action is too rapid rather than too retarded. Browning, in short, had every popular gift except lucidity; love and war were all that he cared about, as they are all that mankind cares about; but he lacked some sixth wit for making his popular sympathies popular. And this he was soon to show in a form almost startling, for in 1840 appeared *Sordello*, which has passed into a sort of joke. Here we have again that note of obscure selection (*Sordello* was some troubadour to whom Dante happens to allude), but of even more obscure treatment. Fortunately he was just about to find his own final method, which he had missed in *Strafford* on the one side and *Sordello* on the other. His plays were just too clever for the audience, and his long poems were too clever for anybody; but by 1842, in the course of his settled series *Bells and Pomegranates*, he had begun to produce the very original type of poem upon which rest most of his fame and all his popularity, and which he called the 'dramatic lyric.' It was something even shorter than a short story in verse; it might almost be said to combine an epigram with a song. More exactly still it may be called a song that sharply changes its tune to take the turns of a tale. The best instances of this invention (for such it almost literally was) are *Times' Revenues*, *Youth and Art*, *Garden Fancies*, *My Last Duchess*, *Fears and Scruples*, *Instans Tyrannus*, *Confessions*, and those noble meditations *By the Fireside* and *A Toccata of Galuppi's*.

These poignant and partly grotesque poems did not appear together, but were scattered or studded like gems in the chinks of all his more ambitious work; but indeed these smaller were the precious stones, and the larger stones were sometimes a little heavy. Thus in the series published from 1841 to 1846 an ambitious historical play like *King Victor and King Charles* would appear beside a mere ballad of boot and saddle like *How they Brought the Good News from Ghent*, but there can be little doubt about which will endure. Thus in that later series called *Men and Women*, which he published in 1855, may be found elaborate, argumentative works such as *Cleon* and *Bishop Blougram's Apology*, but also *Rudel* to the *Lady of Tripoli*, and his most personal poem *One Word More*. This was addressed to the distinguished lady whom he had married in 1846, Elizabeth Barrett, the poetess, still celebrated for poetry as spirited if not as subtle as her husband's. The marriage was really a romantic elopement, such as Browning often urged and described in his poetry; and it is not impossible that if scientific criticism continues along its present lines Browning's marriage may be disproved as part of his own poems. The pair lived chiefly in Italy until Mrs Browning's death in 1861. During this period (over and above the *Men and Women* just mentioned) Browning's only important work was *Christmas Eve and Easter Day*, a fine religious poem chiefly memorable for its expression of Browning's sympathy with a simple Salvationist Protestantism as compared with the cold Protestantism of the Prussian liberalisers of theology. By tradition Browning might almost be called a Puritan, but by temper he was a romantic Puritan.

Moving to London when a widower, Browning opened that epoch of his life that revolves round his longest and in some ways his loftiest achievement. In 1864 he sent out a swarm of those abrupt,

stinging poems called dramatic lyrics under the title of *Dramatis Personæ*; they include *Abt Vogler*, *Prospice*, and several of his most influential utterances. Then occurred an interval in which he received much of his public recognition, including honorary degrees from Oxford and Cambridge; and then in 1869 came his great, one might almost say his colossal, work, *The Ring and the Book*. If it be not great as a poem it must still be considered great as a task. The very smallness of the story increases the sense of gigantic justice and gigantic exhaustion in the analysis. It is an obscure or even squalid tale of 18th century Rome retold from various points of view after the manner of a law court. The husband, the wife, and the wife's alleged lover can each in turn be represented as dubious or criminal; but the ultimate judgment pronounced by the pope shows the husband wrong, the lover pardonable, and the wife pure. It is thus like a large model of Browning's mind, it marks the exact altitude that he occupies towards the moral faiths and doubts of our epoch. He was a liberal; he recognised many points of view, and thought that they should all be urged. But he was not a sceptic in the later sense; he thought there was a truth above and beyond all aspects of it; a truth that must be declared at last. In all his works Browning looks at the truth out of innumerable windows and at innumerable angles. But he looks at it from all sides to assure himself that the truth is there; not (like the later sceptic) to be sure that it is not there, because he has seen it so often.

The Ring and the Book is Browning's high-water mark in the sense that after it his works, clever as they were, consistently exhibited the special faults of his cleverness. He threw forward the learned flank of his mind, and in *Balaustion's Adventure* (1871) and *Aristophanes's Apology* (1875), plunged into the detail of old Greek drama. *Prince Hohenstiel-Schwangau* (1872) tortuously traced the tortuous politics of Napoleon III.; *Fifine at the Fair* toyed with the fashionable doubts about free-love, and *Red Cotton Night-Cap Country* (1873) dealt with a dark story in Normandy rather as *The Ring and the Book* had dealt with a dark story in Rome. His last works of all, such as *La Saisiaz* (1878), *Jocoseria* (1883), *Ferishtah's Fancies* (1884), and *Parleyings with Certain People* (1887), were of a vivacious but miscellaneous and eccentric style; but there is something touching in the fact that *Asolando*, with its fine and famous 'one who never turned his back but marched breast-forward,' was published on the day he died in Venice, the 12th of December 1889.

Browning's unpopularity as a poet, though grossly exaggerated, does spring from two real roots: one the fault of himself and the other of his admirers. His involved form of expression was undoubtedly used in places where he could plead no excuse even of subtlety; but his followers have further obscured him by attaching a pompous intellectual importance to things which he designed (even if unsuccessfully) to be light. Of the intellectuality of Browning's philosophy too much has perhaps been made. Oddly enough, his most sincere philosophy was quite the reverse of intellectual; it was the praise of mere instinct or even of mere passion. His theory of life, if it errs, certainly errs on the side of a dangerous invitation to each man to follow his heart's desire; and if he was an optimist it was only as almost any healthy man is an optimist.

A fault in Browning far more fatal to literature than his obscurity is a certain verbal frivolity which makes him mar plain passages with jests that are not worth making and tricks that are

nothing when achieved. Of this sort are his puns on Wiseman, Newman, and Manning; of this sort are his crazily clever and cacophonous rhymes. Thus in *Old Pictures in Florence* he is urging his favourite ideal of mortal imperfection pointing to immortal perfection, of mortal perfection as something inferior to either, he writes:

Thyself shalt afford the example, Giotto!
Thy one work, not to increase or diminish,
Done at a stroke, was just (was it not?) 'O!
Thy great Campanile is still to finish.

Nobody need ask for a wittier or more poetic figure of speech for great failure and small achievement than this comparison between the perfect circle and the imperfect tower. But Browning must spoil a simple and beautiful effect for the sake of making a bad rhyme to Giotto. This is not in the least obscurity; it is simply ugliness.

It is by his dramatic lyrics that he stands out most picturesquely, and their most fascinating element is their union of wild humour with high and hard thought. It is a rare achievement to mould a medium in which the sublime and the grotesque may melt naturally into each other; it has been done, but not often. The decoration of the Gothic did it; and the rambling style of Rabelais and the irony of Ariosto. In English it has seldom been done so strongly and naturally as in two such verses as these, from the lyric called *Shop* in which Browning pleads for an amateurishness which enlarges life:

I want to know a butcher paints,
A baker rhymes for his pursuit,
Candlestick-maker much acquaints
His soul with song, or, haply mute,
Blows out his brains upon the flute!
But—shop each day and all day long!
Friend, your good angel slept, your star
Suffered eclipse, fate did you wrong!
From where these sorts of treasures are
There should our hearts be—Christ, how far!

These few lines begin with images as broadly comic as a page in *Punch* and they end with a cry as of a saint. Yet the whole moves as naturally as the curl of a great gray gargoyles rises from a goggle-eyed dragon to the garments of the Mother of God.

Finally, these slighter poems of Browning are a turning-point and an inspiration because they gave a fresh and brisk renewal to the profound realism of love-poetry. Love, like all divine things, is sacramental and corporeal; and love-poetry had always concentrated upon material shapes and symbols, special trysting-places, or true lovers' knots. But there had long been a tendency to report these realistic emotions under types too abstract or antiquated. In reading some of the genuine melodies of Byron and of Moore one might fancy that there were no other flowers in the world but roses, and that all important events took place by moonlight. Browning poured into love-poetry a flood of the real facts and circumstances of lovers, unexpected pathways, opening windows, chance sights, and changing weather.

Two fields to cross ere a farm appears,
A tap on the pane; the short, quick scratch,
And blue spurt of a lighted match.

It is that unquestionable match that will be still burning when most of Browning's larger lamps of controversy and learning have burned low.

[See Browning's *Life and Letters*, by Mrs Sutherland Orr, revised and partly rewritten by F. G. Kenyon (1908); with books on him by Symons (1887), Fotheringham (1887), Gosse (1890), Sharp (1890), Hiram Corson (1892), Waugh (1900), Stopford Brooke (1902), Dowden (1904), Herford (1905), Griffin and Minchin (1910), and Mr Chesterton (1903), the writer of the above article; Santayana's *Poetry and Religion* (1900); the *Browning Society's Papers*, Furnivall's *Browning Bibliography*, Mrs Sutherland Orr's *Handbook to Browning* (1885); the

bibliography by Wise in Nicoll and Wise's *Literary Anecdotes of the Nineteenth Century* (1895); Mme. Duclaux's *Grands Écrivains d'Outre-Manche* (1901); and the letters mentioned below. A uniform edition of his works (17 vols.) appeared in 1888-90, a two-vol. edition in 1896, and the Centenary Edition (10 vols.) in 1912.]

His wife, ELIZABETH BARRETT BROWNING, a famous English poetess, was born at Coxhoe Hall, Durham, 6th March 1806. Her father, Edward Moulton, assumed the surname of Barrett on succeeding to estates in Jamaica; and the family afterwards settled at Hope End, near Ledbury, in Hertfordshire. Her extraordinary talents were very early developed. At ten she was able to read Homer in the original, and at fourteen years of age she wrote an epic on *The Battle of Marathon*. About 1824 she seriously injured her spine through an accident in saddling her horse; and she was compelled for a long time to remain in a recumbent position. After her mother's death the family went to Sidmouth, and subsequently settled in London. Her *Essay on Mind, and other Poems*, published when she was nineteen years of age, was succeeded by *The Seraphim, and other Poems* (1838), in which volume was republished the fine poem on Cowper's grave. Shortly after this time she was taken to Torquay for the benefit of her health, and during her stay took place the tragic incident which 'gave a nightmare to her life for ever;' her brother Edward, with some friends, was drowned in Babbicombe Bay. Even after her return to her father's town residence in Gloucester Place she remained for years an invalid confined to the sickroom; but her literary bent was warmly fostered by her relative, Mr Kenyon. In 1844 appeared the *Poems* which contained *The Cry of the Children*, a noble outburst over the wrongs of young children employed in factories. Early in 1846 she first saw Robert Browning, whom she had admired as a poet. The two were married in the following autumn, and in consequence of her fragile health Browning immediately took his wife abroad. Another volume by her appeared in 1850, containing new poems, and a translation of the *Prometheus Bound* of Æschylus, which testified to the learning as well as the genius of the translator. The Brownings settled in Florence, where, in 1849, a son was born, Robert Barrett Browning (d. 1912), who became a sculptor. Mrs Browning was described, in 1851, as 'the soul of fire inclosed in a shell of pearl.' She wrote her poem *Casa Guidi Windows*, in which she expressed her earnest sympathy with the movement for the regeneration of Italy. *Aurora Leigh*, published in 1856, the authoress described as 'the most mature of my works, the one into which my highest convictions of work and art have entered.' In *Poems before Congress* (1860) she again manifested her interest in the development of Italian freedom. Browning's *Mr Sludge, the Medium*, is interesting because it represents Browning's side in a controversy which raged between him and his wife; perhaps their only serious difference. If it was her vanity to be mystical, it was his to be manly, and he chose to see in the experiments of Home the medium the incurable mendacities of a parasite. Even here, however, he remembers his own mysticism; and the poem ends with a spirited outburst by the medium that 'there is something in it, tricks and all.' She died at Florence, 30th June 1861. In 1862 her *Last Poems* were published by her husband. Her *Greek Christian Poets and the English Poets* (1863) consisted of prose essays and translations. Her diction was at times splendidly fervid; but neither fervour nor knowledge of Greek saved her from the most distressing faults of form, barbarous rhymes, slipshod rhythms, and general diffuseness. Her *Sonnets from the Portuguese* have no connection

with Portugal or the Portuguese, but are wholly her own noble love-poems. As poets, few of her sex approach her in strength, imagination, and knowledge; and her letters also were full of poetic fancy and spiritual insight.

See above article and works cited at the end; the letters that passed between her and Browning (1899), and other collections of her letters (1876 and 1897); the Life of her by Ingram (1889); and the French monograph by Merlette (1905).

Brownists. See BROWNE, ROBERT.

Brown-Séquard, ÉDOUARD (1817-94), physiologist and physician, was born in Mauritius, his father being a sea-captain from Philadelphia, U.S., who married on the island a lady called Séquard. The son studied at Paris, and devoting himself especially to physiological research on blood, muscular irritability, animal heat, the spinal cord, and the nervous system. In 1864 he became professor at Harvard, but in 1869 returned to a chair in Paris. In 1873-75 he was a medical practitioner in New York, treating specially diseases of the nervous system; and finally succeeded Claude Bernard as professor of Experimental Medicine at the Collège de France. He published lectures on the physiology and pathology of the nervous system (1860), on paralysis of the lower extremities (1860), on nervous affections (1873), and on the dual character of the brain.

Brownson, ORESTES AUGUSTUS (1803-76), a versatile American writer, born at Stockbridge, Vermont. In turn a Presbyterian, a Universalist, and next a Unitarian pastor, in 1844 he found rest in the Roman Catholic communion. Throughout his life he wrote with ability and warmth in defence of his opinions at the time, and took an active interest in social and political questions. His most important work was published in the *Boston Quarterly Review*, and afterwards in *Brownson's Review*. Among his books are *Charles Elwood, or the Infidel Converted* (1840), *The Spirit-rapper* (1854), and *The Convert* (1857), all with a good deal of autobiographic interest; also *The American Republic* (1865).

Brown Spar. See DOLOMITE.

Brownsville, a port of Texas, on the north bank of the Rio Grande, opposite Matamoros, about 35 miles from the Gulf of Mexico; pop. 12,000.

Broxburn, in Linlithgowshire, on the Union Canal, 12 miles W. of Edinburgh, has great oil-shale pits and paraffin works.

Bruce, the surname of a family illustrious in Scottish history, descended from Robert de Bruis, a Norman knight, who accompanied William the Conqueror to England in 1066. The name, which is undoubtedly territorial, can probably be traced to the lands and castles of Bruis, near Cherbourg in Normandy. The first Robert de Bruis received extensive lands chiefly in Yorkshire. His son, the second Robert, was a companion in arms of Prince David of Scotland, afterwards David I., from whom he received a grant of the lordship of Annandale. At the commencement of the war in England between Stephen and Matilda, niece of the king of Scots, Robert de Bruis adhered to the former, and renounced his allegiance to David, resigning his lands in Annandale to his son Robert. In 1138 he was sent by the barons of the north of England to negotiate with David, who had advanced in support of his niece's claims as far as Northallerton, Yorkshire. In the battle of the Standard which followed, tradition relates that he took prisoner his son Robert, then fourteen years of age, who, as lord of Annandale, fought on the Scottish side. He died in 1141. His English estates were inherited by his eldest son, Adam, whose male line terminated in

Peter Bruce of Skelton, Constable of Scarborough Castle in 1271. Robert Bruce, second lord of Annandale, had two sons: Robert—who married a natural daughter of William the Lion, and died, without issue, before 1191—and William, whose son, Robert, fourth lord of Annandale, married Isabel, second daughter of David, Earl of Huntingdon and Chester, brother of William the Lion, and thus laid the foundation of the royal House of Bruce. He died in 1245.

ROBERT DE BRUCE, fifth lord of Annandale, son of the fourth lord above mentioned, and the competitor with John Baliol for the crown of Scotland, was born in 1210. On the death of his mother, the Princess Isabel, in 1251, he did homage to Henry III. for her lands in England, and in 1255 was made Sheriff of Cumberland, and Constable of the castle of Carlisle. About the same time he was appointed one of the fifteen regents of Scotland during the minority of Alexander III. In 1264 he led, with Comyn and Baliol, the Scottish auxiliaries to the assistance of the English monarch at the battle of Lewes, where he was taken prisoner, but released after the battle of Evesham, the following year. On the Scottish throne becoming vacant at the death, in 1290, of Margaret, the 'Maid of Norway,' granddaughter of Alexander III., Baliol and Bruce claimed the succession, the former as great-grandson of David, Earl of Huntingdon, by his eldest daughter, Margaret; the latter as grandson, by his second daughter, Isabel. Edward I. of England, to whom the dispute was referred, decided in favour of Baliol in 1292. To avoid swearing fealty to his successful rival, Bruce resigned Annandale to his eldest son, Robert Bruce, Earl of Carrick. He died at his castle of Lochmaben, Dumfriesshire, in 1295, leaving three sons and a daughter.

ROBERT DE BRUCE, Earl of Carrick, eldest son of the preceding, is said to have accompanied King Edward I. of England to Palestine in 1269, and was ever after greatly esteemed by that monarch. On his return to Scotland, he married, in 1271, Marjory, Countess of Carrick, and in her right became Earl of Carrick. In 1292 he resigned the earldom of Carrick to his eldest son, Robert, the future king of Scotland, then a minor. On the death of his father in 1295 he did homage to Edward for his English lands, and was appointed keeper of the castle of Carlisle, and in the following year, when Baliol renounced the authority of Edward, Bruce fought on the side of the English. After the battle of Dunbar, in which the Scots were defeated, and Baliol compelled to relinquish the sovereignty, he made application to Edward for the vacant crown, but was refused it. He afterwards went to live on his English estates, where he died in 1304.

ROBERT BRUCE, the most heroic of the Scottish kings, eldest son of the preceding, was born in 1274. In his youth he favoured the English interests, in the expectation, doubtless, of his father being preferred to the Scottish throne. In 1296, as Earl of Carrick, he swore fealty to Edward I. at Berwick, and the following year he renewed his oath of homage at Carlisle. Shortly after, he abandoned the cause of Edward, and with his Carrick vassals joined the Scottish revolt under Wallace. By the Capitulation of Irvine, however, Bruce speedily made his peace with the English monarch. In 1298, the year of the Scottish defeat at Falkirk, Bruce again rose against Edward. He had his lands wasted by the English, and he burned the town of Ayr. But Edward did not proceed to extremities against him. Though Bruce was one of the four regents of Scotland in 1299, he did not again fight against Edward till the final rising in 1306. But while publicly an adherent of the English king, Bruce had entered into

a secret alliance with Lamberton, Bishop of St Andrews, one of the most patriotic of the Scottish clergy. The decisive step was taken by the murder of Comyn at Dumfries. With John Comyn, called the Red Comyn, the nephew of Baliol, he seems to have entered into some agreement as to their rival claims to the throne. They met in the church of the Minorite Friars, Dumfries (10th February 1306); a quarrel took place; and Bruce, in a paroxysm of passion, stabbed Comyn with his dagger. Rushing out to his attendants, he is said to have exclaimed: 'I must be off, for I doubt I have slain the Red Comyn.' 'Doubt!' cried Kirkpartick of Closeburn: 'I mak sikker!' (i.e. sure), and running into the church, despatched Comyn.

The motives and circumstances that led Bruce to the murder of Comyn are not quite clear, but the die was now cast. Bruce hastened to Lochmaben Castle, assembled his vassals, and asserted his right to the throne. Two months later, he was crowned king at Scone. An English army, under the Earl of Pembroke, nominated by Edward governor of Scotland, took possession of Perth, and surprised Bruce in the wood of Methven, compelling him to retreat into the wilds of Athole. At Dalry, near the head of Loch Tay, Bruce was attacked by Alexander, Lord of Lorn, chief of the Macdougals, the Red Comyn's uncle, and compelled to retire. Sending his queen and her ladies to Kildrummie Castle, Aberdeenshire, under the charge of Nigel Bruce and the Earl of Athole, Bruce continued his wanderings in the West Highlands, and then took refuge in the little island of Rathlin, on the north coast of Ireland, where he remained all winter, supposed to be dead. In his absence, the English took the castle of Kildrummie, hanged Nigel Bruce and other chiefs who had defended it, and tore the queen and Princess Marjory from the sanctuary of St Duthac, at Tain. All Bruce's estates were confiscated, and himself and adherents excommunicated by the pope's legate at Carlisle. In the spring of 1307 Bruce landed in Carrick, and at midnight surprised the English garrison in his own castle of Turnberry; but before a superior force he retired into the mountainous districts of Ayrshire. At Loudon Hill in the same year he defeated the English under the Earl of Pembroke.

The death of King Edward in 1307 was the turning-point in the struggle of Bruce. In the following years the English were cleared out of the country and all the great castles recovered, with the exception of that of Stirling. It too was closely pressed by Edward Bruce, who entered into an arrangement with the governor, Sir Philip Mowbray, by which the latter bound himself to surrender it, if not relieved before 24th June following. This led to the memorable battle of Bannockburn (q.v.), 24th June 1314. The English, under Edward II., amounting, it is said, to about 100,000 men, were totally routed by Bruce with an army less than one-third that number. In 1317 Bruce passed over to Ireland to assist his brother Edward, elected king of that country, and defeated the Anglo-Irish at Slane, in Louth. In the year after Bannockburn the Scots repeatedly invaded England, taking the town of Berwick in 1318. The truce of 1323 for some time put a stop to the struggle; but on the accession of Edward III. in 1327 hostilities recommenced with a great Scottish inroad into the northern counties. The war was at last closed by the Treaty of Northampton (1328), recognising the independence of Scotland, and Bruce's right to the throne. His warfare was now accomplished, and suffering under the disease of leprosy, he spent the last two years of his life at Cardross Castle, on the northern shore of the Firth of Clyde. He died in

1329 in his fifty-fifth year, and the twenty-third of his reign. His heart, extracted and embalmed, was delivered to Sir James Douglas, to be carried to Palestine and buried in Jerusalem. Douglas was killed fighting against the Moors in Spain, and the sacred relic of Bruce, with the body of its devoted champion, was brought to Scotland, and buried in the monastery of Melrose. Bruce's body was interred in the Abbey Church of Dunfermline; and, in clearing the foundations for a third church on the same spot in 1818, his bones were discovered. He was twice married: (1) to Isabella, daughter of Donald, tenth Earl of Mar—issue, a daughter, Marjory, wife of Walter the High Steward, whose son ascended the throne as Robert II.; and (2) to Elizabeth, daughter of Aymer de Burgh, Earl of Ulster—issue, one son, who succeeded him as David II. (q.v.), and two daughters.

EDWARD BRUCE, king of Ireland, brother to the above, a chivalrous but rash and impetuous prince, was actively engaged in the struggle for Scotland's independence; and in 1308, after defeating the English twice, made himself master of Galloway. In 1315 the chieftains of Ulster tendered to him the crown of Ireland on condition of his assisting them to expel the English from the island. With a small army of 6000 men he embarked at Ayr, and reached Carrickfergus in that year, accompanied by Sir Thomas Randolph, Earl of Moray, and other Scottish knights of renown. His rapid victories soon made him master of the province of Ulster, and he was crowned king of Ireland in 1316, but was slain at the battle of Dundalk in 1318.

Bruce, JAMES, 'the Abyssinian,' was born at Kinnaird House, Stirlingshire, December 14, 1730. From Harrow he passed, in the winter of 1747, to the university of Edinburgh, with the intention of studying law; but changing his views, he went to London, and having, in February 1754, married the daughter of a wine-merchant's widow, became a partner in the business. His wife dying within a year, he made a tour on the Continent, and on his father's death in 1758 he succeeded to the estate of Kinnaird. In 1761 he retired from the wine-trade, and in 1763 was appointed consul-general at Algiers. He remained there about two years, studying the oriental languages, and acquiring the rudiments of surgery. He then went to Aleppo, where he took further instructions in the medical art, being resolved to travel in the character of a physician. In June 1768, he proceeded to Alexandria, and from Cairo set out on his famous journey to Abyssinia, which forms an epoch in the annals of discovery. Sailing up the Nile to Syene, he crossed the desert to Cosseir, and arrived at Jeddah in April 1769. After various detentions, he reached Gondar, the capital of Abyssinia, in February 1770; and on November 14 of that year, succeeded in reaching the sources of the Abawi, then considered the main stream of the Nile. This accomplishment of the chief object of his journey filled him with the greatest exultation. He remained about two years in Abyssinia, and returning by way of Sennaar and the desert of Assouan, after great hardship reached Alexandria, whence he embarked (March 1773) for Marseilles. In France he spent a considerable time visiting Buffon and other distinguished men, and in 1774 he returned to Scotland. His long-expected *Travels to Discover the Sources of the Nile, in the Years 1768-73*, were published in 1790, in five large quarto vols., with plates and charts. The work contained such curious accounts of the manners and habits of the people of Abyssinia that it startled the belief of many, and some of them were set down as fabrications. Among other doubters were De Tott in France, and Dr Johnson in England. Modern

travellers, including Pearce, Burekhardt, Belzoni, and others, have, however, testified to his general accuracy. Bruce died April 27, 1794, at Kinnaird, of a fall down-stairs.

Bruce, JOHN COLLINGWOOD, antiquary, born at Newcastle in 1805, graduated at Glasgow in 1826, and was trained for the Presbyterian ministry, but devoted himself to teaching. He was Moderator of the English Presbyterian Church in 1881. His works include *The Roman Wall* (1851; 3d ed. 1866); *The Bayeux Tapestry Elucidated* (1856); *Lapidarium Septentrionale* (1875), an account of all the Roman monuments in the north of England; and a *Handbook to the Roman Wall* (1863; 3d ed. 1885). He died 5th April 1892.

Bruce, MICHAEL, Scottish poet, was born 27th March 1746, at Kinnesswood, near the eastern shore of Loch Leven. A weaver's son, he tended sheep in his boyhood, but in 1762 was sent to Edinburgh University to study for the ministry. He had all his life to struggle with poverty; and after he left the university in 1765, and settled as a schoolmaster, first at Gairney Bridge, then near Tillicoultry, to poverty were added sickness and melancholy. He died of consumption, 5th July 1767, aged twenty-one. His tender and pathetic *Poems on Several Occasions*, seventeen in number, were published by the Rev. John Logan, his college friend, in 1770. The authorship of the *Ode to the Cuckoo*, and of some of his hymns, has proved a vexed question of literary controversy, Logan having been charged with appropriating poems by Bruce, and publishing them as his own. Logan's claim is defended by David Laing and J. Small (1873-78), Bruce's by Mackelvie (1837), Grosart (1865-86), and Mackenzie (1905).

Brucea, a genus of Simarubaceæ (q.v.), named after the famous Abyssinian traveller. The leaves are intensely bitter, astringent, and tonic, like those of Quassia (q.v.).—By mistake the name *Brucine* (see below) was given to an alkaloid really produced by the *Nux Vomica* (q.v.) and other species of *Strychnos*.

Bruch, MAX (1838-1920), an eminent composer, was born of Jewish parents at Cologne, and from 1870 lived mainly at Berlin and Bonn. In 1880-83 he was conductor of the Liverpool Philharmonic Society. He is specially famous for his epic cantatas (*Frithiof*, *Salamis*, *Normannenzug*), his orchestral music (especially the scenes from *Frithiof's Saga*), his operas *Die Jungfrau von Orleans* and *Hermione*, and his violin concertos.

Bruchsal, a town of Baden, on the Saalbach, 12 miles NE. of Karlsruhe. The Old Town, around which are four suburbs, contains the castle of the prince-bishops of Spire, who resided here from the 16th century, and whose ancient tombs are pointed out in the church of St Peter. Bruchsal has a large prison organised on a modified form of the Pennsylvania system. Machinery, cigars, paper, and soap are manufactured, and there is an active trade in hops, tobacco, and corn. Population, 15,000.

Brucine is one of the Alkaloids (q.v.) present in *Strychnos Nux Vomica*, and St Ignatius' bean, along with strychnine, &c. In action it resembles strychnine, but is only about one-twelfth of its strength, and on this account is seldom employed. It is mainly characterised by giving a blood-red colour with concentrated commercial nitric acid, and, indeed, the red colour always yielded by *nux vomica*, and occasionally by strychnine, when treated with nitric acid, is due to the presence of brucine. Brucine is capable of being converted into strychnine by heating it with five times its weight of dilute nitric acid, carbonic acid gas being given off.

Bruck, (1) a walled town of Lower Austria, dating from the 3d century, on the left bank of the Leitha, 24 miles S.E. of Vienna, with a princely castle; pop. 5000.—(2) A town of Austria (Styria), on the Mur, 25 miles NNW. of Graz, with iron-works, &c.; pop. 7000.—(3) A market-town of Bavaria, 15 miles W. of Munich, with the buildings of a Cistercian monastery, founded in 1266; pop. 5000.

Brückenau, a small town of Bavaria, on the Sinn, 17 miles NW. of Kissingen. The baths are picturesquely situated in the valley, about 2 miles off. The three warm springs are chiefly of use in nervous and cutaneous diseases.

Brucker, JOHANN JAKOB (1696-1770), historian and biographer, born at Augsburg, studied at Jena, and became pastor at Augsburg. A laborious and voluminous writer, he is chiefly remembered by his *Historia Critica Philosophiæ* (5 vols. 1742-44; new ed. 1767).

Bruckner, ANTON, composer, was born at Ansfelden, Upper Austria, 24th September 1824, played the organ, taught in Vienna conservatorium and university, and died in Vienna, 11th October 1896. A strong Wagnerian, he composed nine symphonies (the last incomplete) and some masses.

Brueghel. See BREUGHEL.

Bruges (Flem. *Brugge*, so called from its many bridges), a city of Belgium, capital of the province of West Flanders, is situated in a fertile plain about 8 miles from the sea, with which it is connected by the three canals from Ghent, Sluys, and Ostend, besides the great ship-canal to Zeebrugge. The inhabitants depend, nevertheless, for their supply of water principally upon rain-water, which is collected in large cisterns, public and private. The ramparts form an agreeable promenade, and the streets have a venerable and picturesque yet deserted aspect, the population being now scarcely a quarter of what it was during the middle ages. Among the most interesting buildings are Les Halles (1364), a museum and market, with the famous Belfry (q.v.); the Gothic hôtel-de-ville (1377, restored 1895); the Chapel of the Holy Blood; the church of Notre Dame, with a spire 442 feet high, many valuable paintings, exquisite wood-carvings, a statue of the Virgin (said to be by Michelangelo), and monuments of Charles the Bold and his daughter Mary, wife of the Emperor Maximilian; the cathedral of St Sauveur, with an ugly brick exterior, but a fine interior, containing the stalls of the knights of the Golden Fleece (q.v.); and St John's Hospital, with Hans Memling's masterpieces adorning the reliquary of St Ursula's arm. Bruges has manufactures of lace, woollens, linen, cotton, leather, soap, starch, and tobacco; and distilleries, sugar and salt refineries, and shipbuilding-yards. Of late its position on railways and canals has partly restored its commercial importance, a ship-canal to Zeebrugge (q.v.; 'Bruges-on-Sea') having been opened in 1905. The population is about 54,000—many of them in extreme poverty, the excellent charitable institutions being accordingly heavily taxed. Dating from the 3d century, Bruges by 1200 was the central mart of the Hanseatic League; and a hundred years later it may be said to have become the metropolis of the world's commerce. Commercial agents from seventeen different kingdoms resided here, and no less than twenty ministers from foreign courts had mansions within its walls. Its population at this time amounted to upwards of 200,000. In 1488 the citizens rose in insurrection, and imprisoned the Archduke Maximilian, and with the harsh measures of repression which ensued commenced the commercial decline of Bruges. Many

of the traders and manufacturers, driven forth from their own country by the religious persecutions of the following century, settled in England, and brought with them their manufacturing superiority. In the 16th century, however, the tapestry of Bruges was still celebrated. Taken by the French in 1794, in 1815 the city became a part of the kingdom of the United Netherlands, and in 1830 of the Belgian monarchy. It was held by the Germans in 1914-18. Bruges was the home of Memling and Pourbus and Stevinus, and of Jan van Eyck for a time; Caxton was here in 1446-70.

Brugg, a town in the Swiss canton of Aargau, on the right bank of the Aar, 36 miles ESE. of Basel. It was the cradle of the House of Hapsburg, whose ruined castle, founded in 1020, crowns a wooded height near. In the vaults of the abbey of Königsfelden (1310; now an asylum) are interred many of the members of the family. Zimmermann was a native. Pop. 4000.

Brugge. See BRUGES.

Brugmann, FRIEDRICH KARL (1849-1919), comparative philologist, was born at Wiesbaden. He studied at Halle and Leipzig, and after teaching in Wiesbaden and Leipzig became professor of Comparative Philology at Freiburg (1884) and Leipzig (1887). With Osthoff, his fellow-leader of the Junggrammatiker School, he wrote *Morphologische Untersuchungen auf dem Gebiet der indogermanischen Sprachen* (1878-89), in which the fixity of the laws of sound-change and the importance of analogy in the history of language were maintained. A contribution to Curtius's *Studien zur griechischen und lateinischen Grammatik* (1897) led to an embittered dispute with that scholar. Brugmann's great work is the epoch-making *Grundriss des vergleichenden Grammatik der indogermanischen Sprachen* (1886-1900), with additional volumes by Delbrück. He was joint editor of the *Indogermanische Forschungen*.

Brugsch, HEINRICH KARL (1827-94), Egyptologist, born at Berlin, took part in 1853 in Mariette's excavations at Memphis. He was called to the chair of Oriental Languages at Göttingen, but returned to Egypt in 1870 as head of the School of Egyptology at Cairo with the rank of bey, becoming pasha in 1881. Brugsch's numerous and valuable works include dictionaries and works on grammar, inscriptions, history, geography, and religion. See his *Mein Leben und mein Wandern* (1894).

Brühl, a town of Rheinland, 8 miles SSW. of Cologne by rail. It has a splendid castle, erected in the early part of the 18th century by the Elector Clement Augustus of Bavaria, and restored by the king of Prussia in 1842. After his banishment from France in 1651, Cardinal Mazarin took up his residence in Brühl. Pop. 8000.

Brühl, HEINRICH, COUNT VON, prime-minister of Augustus III., king of Poland and Elector of Saxony, memorable among unworthy ministers and venal statesmen. He was born in 1700 at Weissenfels, and in early life entered, as a page, into the service of the Duchess of Saxe-Weissenfels. His winning address and tact gained for him rapid promotion through several offices of state, until, in 1746, he became prime-minister to that idle and unpatriotic ruler, Augustus III. With the basest and most slavish sycophancy, he humoured the whims of his unworthy master, draining the coffers of the state, and burdening the country with debt, to supply him with money to squander on his follies. Yet he contrived to enrich himself, and to accumulate honours and titles. He kept a horde of servants, and maintained the most splendid establishment in the kingdom. The effect of his reckless robbery of the national finances made itself felt at the outbreak of the Seven Years' War,

when the country could furnish only 17,000 men to oppose Frederick of Prussia, who surprised and captured the whole Saxon army in its camp at Pirna. Augustus and Brühl fled to Warsaw. When peace was concluded, they returned to Dresden, where Augustus died on the 5th October 1763. His worthless parasite had the grace to follow him three weeks later (28th October).

Bruise, or **CONTUSION**, signifies an injury inflicted by a blow or sudden pressure, in which the skin is not wounded, and no bone is broken or dislocated. Both terms, and especially the latter, are employed in surgery to include all such injuries in their widest range, from a black eye to a thoroughly crushed mass of muscle. In the slighter forms of this injury, as in ordinary simple bruises, there is no tearing, but only a concussion of the textures, the utmost damage done being the rupture of a few small blood-vessels, which occasions the discoloration that is always observed in these cases. In more severe contusions, the subjacent structures—muscles, connective tissue, vessels, &c.—are more or less ruptured, and in extreme cases, are thoroughly crushed, and usually become gangrenous. The quantity of blood that is extravasated mainly depends upon the size and number of the ruptured blood-vessels, but partly also on the nature of the textures of the injured part. Thus, a lax tissue, as that of the eyelids, favours the escape of blood into the surrounding parts. Moreover, the constitution of the patient has some influence, and many persons, especially, according to Paget, pallid, fatty, soft-skinned women, though suffering from no apparent disease, as well as those affected with scurvy or with the 'hemorrhagic diathesis' (see **HÆMOPHILIA**), are subject to extravasations, and consequently to discolorations, very disproportionate to the injuries that cause them.

The most characteristic signs of a recent contusion are more or less Shock (q.v.), pain, swelling, and discoloration of the surface from effused blood (commonly known as *Echymosis*, q.v.). There is nothing special in the character of the shock, but it is worthy of notice that it is most severely felt in injuries of special parts—as the testes, the breasts, and the larger joints, which are often followed by remarkable general depression, faintness, loss of muscular power, and nausea. The immediate pain following the blow is succeeded by a feeling of numbness, which, after a varying time, unless the part is killed, gives place to a heavy, aching pain. Although some depression may usually be observed immediately after the infliction of the blow, swelling of the parts rapidly follows, as may be well seen when a child receives a blow on the head, or in the wale that rises after the lash of a whip. In lax parts, such as the eyelids, the swelling is often considerable, and may remain for a week or more; but in other parts it usually subsides in two or three days. The discoloration of the skin consequent on blows is of a more or less purple tint, varying from black to crimson or pink. 'Blackness,' says Paget, 'usually indicating intense injury, is probably due to the extravasation of a large proportion of entire blood; crimson or pink tints, to the prevalence of a blood-stained fluid; blue, to the degrees in which blackness is veiled by the cuticle and skin, as the colour of blood in veins is; and perhaps some of the shades of pink to the partial aeration of the blood by the penetration of air through the epidermis. After a variable time, proportionate to the severity of the injury, these colours fade out, passing most commonly through gradually lightening shades of brownish olive, green, and yellow.' The causes of these changes of colour are not clearly known; as, however, the changes are not observed in bruises

of parts removed from air and light, they are probably due to oxidation and actinic agency. When a severe bruise tends to a natural cure, and there is no inflammation or sloughing, the effused blood is generally absorbed, the liquid portion rapidly disappearing, while the blood-cells are more slowly removed. In some cases, it is possible that the effused blood may become organised into vascular connective tissue, which takes part in the repair of the injured tissue. We need not follow the course of a bruise in which active inflammation with suppuration ensues, or in which sloughing takes place, as these complications must be treated according to the ordinary rules for those affections. There are, however, one or two ill consequences following partial recovery, which require notice. Thus, in some organs, as the breast, abscess may ensue long after a blow; or a sensitive indurated lump may remain; or (more commonly) there may be long-continued pain, without change of texture; or, lastly, cancer may ensue. Blows on superficial bones, as those on the skull, are not unfrequently followed by very painful thickening of the periosteum; a muscle violently struck may be paralysed, and rapidly waste away; and constitutional diseases, such as gout and rheumatism, are well known to localise themselves with special severity in parts that have once been seriously bruised.

With regard to treatment, simple and not very severe bruises require little treatment but the rest necessary for the avoidance of pain; but the removal of the swelling and discoloration may be hastened by the application of various local stimulants, which seem to act by accelerating the circulation through the bruised part, and promoting the absorption of the effused fluid. Friar's balsam, compound soap liniment, or poultices made with the roots of black bryony beaten to a pulp, are popular remedies of this class. Tincture of arnica has a great reputation; but experiments have made it very doubtful whether it is any more efficacious than simple spirit of the same strength. A solution of sulphurous acid, and hazeline and other preparations of the American Witch-hazel (q.v.), are of more value. They should be kept constantly applied to the bruised part on lint or cotton-wool. Pugilists, who are probably better acquainted with ordinary bruises than any other class of men, are in the habit of removing the swelling of the eyelids that often naturally occurs during a prize-fight to such an extent as to close the eyes, by at once puncturing the eyelids at several points with a lancet; and their favourite remedy for a black eye or other bruise on the face is a fresh beefsteak applied locally as a poultice. Severe bruises must at once be placed in the hands of a surgeon.

Brülov (or **BRYLOF**), **CONSTANTINE PAVLOVICH** (1799–1852), a great Russian historical, religious, and portrait painter, born at Petersburg.

Brumaire (Fr., 'foggy month'), a division of the year in the republican calendar of France. It includes the time from October 22 to November 20. The celebrated 18th Brumaire, which witnessed the overthrow of the Directory (q.v.) and the establishment of the sway of Napoleon, corresponds with November 9, 1799, of the Gregorian calendar.

Brummell, **GEORGE BRYAN**, better known as 'Beau Brummell,' was born in London, 7th June 1778, the son of Lord North's private secretary, and grandson of a gentleman's gentleman. At Eton, and during a brief sojourn at Oxford, he was less distinguished for studiousness than for the exquisiteness of his dress and manners; and after four years in the army, having come into a fortune of £30,000, he entered society on his true vocation of arbiter of elegancies. His success was brilliant;

but the pace was too hot, and his wit was, moreover, too fine for his twenty years' patron and admirer, the Prince Regent. They quarrelled in 1813, and gambling debts three years later forced Brummell to flee to Calais. He struggled on there, reckless as before, for fourteen years; from 1830 to 1832 held a sinecure consulate at Caen; and, after three years of drivelling imbecility, died in the pauper lunatic asylum of that old Norman city, 30th March 1840. See his *Life* by Jesse (1844; new ed. 1886), and one by Boutet de Monvel (1908).

Brunai, or BRUNÉI, a British protectorate in the NW. of Borneo, till 1888 nominally an independent Mohammedan territory, whose sultan was formerly overlord of the whole island; since 1906 administered by a British Resident. Pop. 25,000, divided into trade castes. The capital, Brunai, on a river of the same name, is a miserable, dirty town, built on piles. The trade is small, the chief exports being cutch, coal, and rubber. See BORNEO.

Brunanburh, the scene in 937 of a bloody battle, in which Athelstan (q.v.) defeated an allied army of Welsh, Scots, and Danes, variously placed in Lothian, Northumberland, Yorkshire, Lancashire (south of Preston or at Burnley), near Axminster in Devon, at Brumby in Lincolnshire, at Bromborough in Cheshire, and at Burnswark in Dumfriesshire. Of the Old English poem on the victory, preserved in the Chronicle, there is a spirited version by Lord Tennyson.

Brunck, RICHARD FRANÇOIS PHILIPPE, classical scholar, was born at Strasburg, December 30, 1729. He was educated under the Jesuits in Paris, but abandoned his studies, and for some time was engaged as a military commissary during the Seven Years' War. A professor in Giessen, with whom Brunck happened to lodge while the army was in winter-quarters, revived in him the love of classical studies. Returning to Strasburg, he devoted all his spare time to Greek, and soon distinguished himself as an able but daring critic and emendator. His belief that all inaccuracies in ancient Greek writings were introduced by copyists often led him astray; but few critics since the revival of learning have done more for the progress of Greek literature. His first work, *Analecta Veterum Poëtarum Græcorum* (1772-76), was followed by editions of Anacreon (1778), Apollonius Rhodius (1780), Aristophanes (1781-83), *Poëta Gnomici* (1784), Virgil (1785), and Sophocles (1786). The outbreak of the French Revolution interrupted Brunck's studies. During the Terror he was imprisoned, but was liberated after the downfall of Robespierre. His means had been so much reduced, that he was compelled to sell his valuable library. He died June 12, 1803.

Brune, GUILLAUME MARIE ANNE, a French marshal of the First Empire, was born at Brivela-Gaillarde, 13th March 1763. At first a Paris bookseller, he was a member of the Cordeliers' Club, and a friend of Danton. In 1792 he was sent as civil commissary to Belgium, but he soon entered the army, fought in the Vendean war and in Italy under Massena, and after Rivoli, was made general of division. Sent by the Directory to Switzerland in 1798, he executed his orders with brilliant success. In 1799 he was appointed to the command of the army of Holland, where he achieved the reputation of being one of the best generals of his age. He defeated the Duke of York at Bergen, September 19, and forced him to capitulate at Alkmaar. In 1803 he was ambassador to Turkey; next year he obtained the dignity of marshal. In 1807 he became governor-general of the Hanseatic towns, but soon exciting the distrust of Napoleon, was recalled. After the return from Elba he joined the emperor, was made a peer, but, like many better

men, had his prospects blasted by Waterloo. On 2d August 1815 he was brutally murdered by an infuriated royalist mob at Avignon. See *Lives* of him published in 1821 and 1887, and that by Marmon (1900).

Brunel, ISAMBARD KINGDOM, engineer, only son of the following, was born at Portsmouth, 9th April 1806, and in 1823, after two years spent at the college of Henri Quatre, in Paris, entered his father's office. He helped him in the construction of the Thames Tunnel, and himself, in 1829-31, planned the Clifton Suspension Bridge, which, commenced in 1835, was completed only in 1864 with the materials of his own Hungerford Suspension Bridge (1841-45) over the Thames at Charing Cross (see BRIDGE, p. 445). He designed the *Great Western* (1838), the first steamship built to cross the Atlantic, and the *Great Britain* (1845), the first ocean screw-steamer. The *Great Eastern* (q.v.), the largest vessel ever built in the world, was built under his sole direction in 1853-58. In 1833 he was appointed engineer to the Great Western Railway, and designed and constructed the whole of the tunnels, bridges, viaducts, and arches on that line. Among docks at English seaports, in the improvement or construction of which he was engaged, may be mentioned those of Bristol, Monkwearmouth, Cardiff, and Milford Haven. Made a Fellow of the Royal Society in 1830, he was chosen on the Council of the Institution of Civil Engineers in 1845, and its Vice-president from 1850. He died suddenly, 15th September 1859. See his *Life* by his son (1870).

Brunel, SIR MARC ISAMBARD, engineer, was born, a farmer's son, at Hacqueville, near Rouen, in France, April 25, 1769. He was destined for the church, but early showed an inclination for mechanics, and at school preferred the study of the exact sciences to the classics. In 1786 he became a sailor in the French navy. In the revolutionary period of 1793, having compromised himself by his political opinions, he escaped from Paris to the United States. His career as an engineer began in 1794, when he was appointed to survey for the canal which now connects Lake Champlain with the river Hudson at Albany. He afterwards acted as an architect in New York, for which city he was appointed chief-engineer, and erected an arsenal and cannon-foundry, with ingenious machinery for casting and boring. On his return to Europe in 1799, he married the daughter of William Kingdom, Plymouth, and settled in England. His mechanical skill was shown in various minor inventions, such as a writing and drawing machine, and a machine for winding cotton thread. A plan submitted by him to government for making block-pulleys for ships by machinery was adopted in 1803, and he was for many years employed in carrying it into execution in Portsmouth dockyard. On the completion of the machinery in 1806 the saving on the first year in the manufacture of the blocks was about £24,000. He received £17,000 from government as a reward for this invention. He was also successful in the construction of other public works—in Woolwich arsenal and Chatham dockyard, &c. He made experiments in steam-navigation on the Thames in 1812, but his proposals for the use of steam-tugs were declined by the navy board. The destruction of his sawmills at Battersea by fire (1814) led, with financial mismanagement, to his bankruptcy (1821), when he was thrown into prison for debt. He was released from prison on a grant of £5000 being made by government for payment of his debts. His most remarkable undertaking was the Thames Tunnel beneath the bed of the river, which, commenced in March

1825, was opened in March 1843. Assisted by his son, Isambard Kingdom Brunel, he for ten years pursued a course of experiments for employing carbonic acid gas as a motive power, but the cost of the machinery prevented its introduction as a substitute for steam. Among the less important of Brunel's inventions were machines for making wooden boxes; for ruling paper; for shuffling a pack of cards without using the hands; for the manufacture of nails; for making seamless shoes for the army; a knitting-machine; a preparation of tinfoil for ornamentation; and improvements in stereotype plates. Elected a Fellow of the Royal Society in 1814, he was appointed Vice-president in 1832, and was a member of various foreign societies. He was knighted in 1841; and died December 12, 1849, in his eighty-first year. See his Life by Beamish (1862).

Brunelleschi, FILIPPO, one of the greatest Italian architects, was born at Florence in 1377. A goldsmith first, then a sculptor, he finally devoted himself to architecture, studying zealously perspective and geometry. At Rome he became imbued with classical traditions, and soon after his return to Florence in 1407, he offered his plan for completing the cathedral of Santa Maria del Fiore, founded in 1296, and now only wanting a dome. The great work, which served as model to Michelangelo at St Peter's, was begun in 1419 and almost finished when he died at Florence in 1446. He was also architect of the Pitti Palace.

Brunetière, FERDINAND, critic, was born at Toulon, 19th July 1849, wrote much for the *Revue des Deux Mondes* (its editor from 1893), became professor at the Ecole Normale and a member of the Academy (1894), and died 9th December 1906. Besides *Études Critiques* and *Questions de Critique*, he published *Histoire et Littérature* (1884-87), *Le Roman Naturaliste* (1883), *History of French Literature*, (trans. 1898). See monograph by Faguet (1911).

Brunhilda, (1) in the *Nibelungenlied*, the young and stalwart queen of Iceland, wife of Gunther, the Burgundian king. She hated passionately Kriemhild and her husband, Siegfried, who had once been her own lover; and she caused his murder by the hands of Hagen. Originally she was identical with the Norse Walkyrie *Brynhildr*, who for a fault was stripped of her divinity by Odin and sunk into a charmed sleep from which she was awakened by Sigurd (Siegfried).—(2) The daughter of the Visigothic king Athanagild, married King Sigbert of Austrasia in 567, and afterwards as regent for her two grandsons, Theodebert II., king of Austrasia, and Theodoric II., king of Burgundy, divided the government of the whole Frankish world with her rival Fredegond, who governed Neustria for the youthful Clotaire II. On the death of Fredegond in 598 she seized on Neustria, and for a while united under her rule the whole Merovingian dominions, but was overthrown in 613 by a combination in their own interests of the Austrasian nobles under the nominal leadership of Clotaire II., and put to death by being dragged at the heels of a wild horse.

Bruni, LEONARDO, a famous humanist, a native of Arezzo, and hence styled *Aretino*, was born in 1369. He first studied law at Florence and Ravenna, but afterwards turned his attention to classical literature. In 1405 he obtained the office of papal secretary, and as such served under four popes, the last of whom, John XXIII., he attended to the Council of Constance. On his patron's deposition he returned to Florence. His *Historia Florentina* procured for him the rights of citizenship, and at a later period, through the favour of the Medicean family, he was appointed state secretary. He died 9th March 1444. Bruni aided

in advancing the study of Greek literature mainly by his literal translations into Latin of Aristotle, Demosthenes, Plato, and Plutarch. Among his original works were *Commentarius Rerum suo Tempore Gestarum* (Ven. 1476), *De Origine Urbis Mantue*, *De Romæ Origine*, *Epistolæ Familiæres*, and *Lives of Petrarch and Dante* in the vernacular.

Brünig, a Swiss pass (3396 feet), forming the shortest and easiest route between the 'Forest Cantons' and the Bernese Oberland. A road was formed in 1857-62, and in 1888 a Brünig branch of the Berne-Lucerne Railway was opened.

Bruni Island (North and South) lies off the south coast of Tasmania, about 20 miles below Hobart, from which it is separated by D'Entrecasteaux Channel. It has a length of 32 miles, a varying breadth of 1 to 11 miles, and an area of 160 sq. m.

Brünn (Cz. *Brno*), a city of Czechoslovakia, the capital of Moravia, is beautifully situated, partly on the slope of a hill, and partly in a pleasant valley at the confluence of the Schwarzawa and the Zvittawa, 93 miles N. of Vienna by rail. Behind the city, on an eminence (984 feet), rises the castle of Spielberg, formerly the citadel, notorious as the state-prison where Silvio Pellico was confined from 1822 to 1830. The Czech university was inaugurated in 1919. Brünn was surrounded by walls till 1860. Among the most interesting buildings are the cathedral of St Peter; St James's Church, a Gothic edifice, with a tower 305 feet in height; the church of the Minorites; and the Augustine convent of which Gregor Mendel (q.v.) was a monk. The Stadttheater, opened in 1882, was the first continental theatre lit by electricity. Brünn is a very important manufacturing town. Its woollens are specially celebrated, and it has also large manufactures of machinery, linen, leather, paper, ironware, upholstery, liqueurs, and numerous chemical products. Pop. 220,000 (nearly half Czechs).

Brunne, ROBERT OF, the name by which Robert Manning, a monk of the order founded by St Gilbert of Sempringham, is usually designated. His monastery was in South Lincolnshire, near the modern town of Bourn, and he lived in the reigns of Edward II. and Edward III., and probably died about 1340. His chief work is his *Handlyng Synne*, a free and amplified translation into English verse of William of Waddington's *Manuel des Pêcheurs*, with such judicious omissions and excellent additions as made his version much more entertaining than the original. The purpose of the book was to convey religious instruction to the people in the agreeable form of moral anecdotes. It is of great importance from the linguistic point of view as one of our best landmarks in the transition from the early to the later Middle English. He also made a new version in octosyllabic rhyme of Wace's *Brut d'Angleterre*, and added to it a popular translation of the French rhyming chronicle of Peter Langtoft of Bridlington. Robert deliberately wrote in English instead of French, in order to reach the common people, to give them the means 'for to haf solace and gamen, in felauschip when tha sit samen [together].'

Brunnen, a village, the port of the Swiss canton of Schwyz, on the Lake of Lucerne, near the mouth of the Muotta, 17 miles by water, but 28½ by rail ESE. of Lucerne. Here in 1315, after the battle of Morgarten, the deputies of the Forest Cantons formed a league.

Brunnow, PHILIPP, COUNT VON, a Russian diplomatist, was born at Dresden in 1797, and entered the Russian service in 1818. He was present in a civil capacity in the campaigns of

1828 and 1829 against the Turks, and in 1839 he was sent on a special mission to London, where, in the following spring, he was accredited as permanent ambassador. In this capacity he soon acquired distinction as a diplomatist. After retiring from London on the outbreak of the war in 1854, he represented Russia in Frankfort, and, along with Count Orloff, was sent to the Conference of Paris in 1856. He was afterwards appointed to the court of Prussia; but in 1858 he returned to his old place in London, where he represented Russia at the conferences in 1864 and 1871. He was raised to the rank of count in 1871, and in 1874 retired to Darmstadt, where he died 12th April 1875.

Bruno, GIORDANO, a fervid, restless, profound philosopher, was born at Nola, in the kingdom of Naples, about the middle of the 16th century. He entered at an early age the order of the Dominicans, but soon began to express his doubts in regard to the doctrines of Transubstantiation and of the Immaculate Conception, in consequence of which he was obliged to flee from his convent. Henceforth his life was unsettled. In 1577 he went to Geneva, where he spent two years, but having excited the suspicion and dislike of the strict Calvinists of that city by his general scepticism, he judged it prudent to betake himself to Paris, where he delivered prelections on the 'Great Art' (Logie) of Raymond Lully. His disputes with the bigoted Aristotelians of the university of Paris compelled him, however, to leave France. He passed over into England, where he resided for two years in comparative quiet, enjoying the friendship of Sir Philip Sidney and the protection of the French ambassador, Michel de Castelnau. Here he composed his most important works, but at last, having incurred the displeasure of the clergy by his vehement denunciation of the Aristotelian philosophy and by other grave heresies, he returned to Paris in 1585. In 1586 he proceeded to the university of Marburg, where he matriculated, but was forbidden to lecture, and to Wittenberg, where he became professor. After spending some time in Prague, Brunswick, Helmstedt, and Frankfort-on-the-Main, he resolved to go back to Italy. He fixed his residence at Padua; but venturing to settle in Venice, he was arrested by the officers of the Inquisition, and conveyed to Rome in 1593. He was now subjected to a long imprisonment and persecution, in the vain hope that he would recant; but when all the endeavours of his enemies proved ineffectual, he was brought to the stake, 17th February 1600, and burnt as a heretic. On the scene of his martyrdom, the *Campo dei Fiori*, a monument to his memory was unveiled in 1889. Two new editions of his works, one by Lagarde and one by Tocco and Vitelli, have been published.

Bruno's writings, of which the most valuable are composed in Italian, display throughout a strong, courageous, excitable soul, susceptible of deep enthusiasm, full of mental unrest and scepticism, but guided by an unsatisfied yearning for truth. His speculations are sublime. The *Cena delle Ceneri*, or Evening Conversations on Ash-Wednesday, is an apology for the Copernican astronomy; the *Spaccio della Bestia Trionfante*, or Expulsion of the Triumphant Beast (Paris, 1584), is a satirical and somewhat heavy allegory in the style of the times, but it gives perhaps the clearest account of Bruno's philosophy. His greatest works are metaphysical, such as the *Della Causa Principio ed Uno* (On the One Sole Cause of Things), and the *Del Infinito Universo e Mondi* (On the Infinity of the Universe and of Worlds). The doctrine enunciated in these is Pantheistic (see PANTHEISM). Bruno held that the infinite soul of God did not merely inhabit or pervade the

universe, but that the universe was simply a manifestation of Him, and therefore itself divine. God was therefore, in the most literal and physical sense, all in all. Bruno's philosophy, in later times, was quite unappreciated and even neglected, until Jacobi drew public attention to it in his *Letters on the Doctrine of Spinoza*. Both Spinoza and Descartes were much indebted to Bruno. His influence is also discernible in the speculation of modern Germany; one of Schelling's notable works is entitled *Bruno*. But some modern critics are inclined to insist on his loquacity, bombast, quackery, and intellectual arrogance, and to deny him real originality.

See works on Bruno by Bartholmæss (Paris, 1846), Berti (Flor. 1880), Sigwart (Tüb. 1880), Brunnhofer (Leip. 1883), Miss Frith (1887), L. M'Intyre (1903), Alois Riehl (2d ed. 1900; trans. 1906), Boultong (1916), Gentile (1921), and especially Spampinato (1921); also J. A. Symonds's exposition of his teaching, and W. Pater's *Gaston de Latour* (1896).

Bruno, St., the founder of the Carthusian order, was born at Cologne about 1040, and received his earliest education there. Subsequently he became rector of the cathedral school at Rheims. But the wickedness of his time soon began to weigh upon his soul, and in 1086, with six friends, he betook himself to the wild mountain of Chartreuse, near Grenoble. Here he founded the order of the Carthusians (q.v.), one of the most austere of all the monkish orders. Bruno and his companions had each a separate cell in which they practised the severities of the rule of St Benedict, keeping silence during six days of the week, and only on Sundays seeing one another. Pope Urban II., who was one of Bruno's most eminent scholars, in 1089 summoned the saint to Rome. He obeyed the call reluctantly, and steadily refused all offers of preferment. In 1094 he established a second Carthusian monastery at Della Torre, in a solitary district of Calabria, where he died in 1101. He was canonised in 1628; his festival is the 6th October. Bruno left no written regulations for his followers. These first appeared in a complete form in 1581, and were enjoined on all Carthusians by Innocent IX.

Bruno the Great, one of the most eminent men of his time, was born about 925, the third son of Henry the Fowler. He became archbishop of Cologne and chancellor of the empire under his brother Otto I., and afterwards Duke of Lorraine. Having done much to reform the monasteries and advance learning among the clergy, he died at Reims in 965.

Brunonian System. See BROWN (JOHN).

Brunsbüttel, a small port of Sleswick-Holstein, at the mouth of the Elbe, the terminus of the great North Sea and Baltic Canal.

Brunswick (Ger. *Braunschweig*), a state (formerly a duchy) of northern Germany, consisting of three larger and five smaller distinct parts, with a total area of 1418 sq. m. Pop. (1875) 327,493; (1919) 481,436. Of the three larger parts, the principal one, forming the circle of Wolfenbüttel, and including the capital, lies between Prussia and Hanover; the second, extending westward from Prussia to the Weser, divides Hanover into two parts; and the third, forming the Blankenburg district, lies to the south-east, between Hanover, Anhalt, and Prussia. The smaller parts are the isolated enclaves of Calvörde in the east, Thedinghausen in the west (not far from Bremen), and some very small demesnes on the Hanoverian boundaries. Brunswick belongs mostly to the basin of the Weser, which serves as a boundary on the west. Its surface is mostly mountainous, particularly in the southern portions of the country, but it has nevertheless level tracts of considerable

extent. The climate in the lowlands resembles the general climate of northern Germany; but in the Harz district it is so much colder that harvest is generally a month later than in the plains.

The quarries and mines of Brunswick produce marble, alabaster, limestone, coal, iron, copper, lead, sulphur, alum, and salt in large quantities, with some little gold and silver. Agriculture constitutes the chief wealth of the state. The pasture-land is extensive, and great attention is paid to the rearing of cattle, and especially to the breeding of sheep, wool being an important article of commerce. A large number of persons are employed in the cutting and preparation of timber. The manufactures are comparatively unimportant.

The inhabitants are mostly Saxons, and, with a few exceptions, adhere to the Lutheran Church. The people in the rural districts speak a very broad Low-German dialect; but good High-German is spoken by the educated classes. The government, till 1918, was a limited monarchy, the duke's power being restricted by the legislature. Under the constitution of 1922 a diet of 60 members is elected for four years by universal, secret, and direct vote of the people. The principle of proportional representation is observed. The diet chooses the ministry. The estates of the dukedom of Brunswick, which were very large, are now the property of the people.

Brunswick was included as a part of Saxony under the empire of Charlemagne. In 1235, with Lüneburg, it was made a duchy under Otto, who died in 1252, and was succeeded in 1267 by his son Albrecht, founder of the older line of Wolfenbüttel. John, another son of Otto, was the founder of the older Lüneburg line, which became extinct with William of Lüneburg in 1369. In 1569 Henry, who styled himself Duke of Brunswick-Lüneburg-Dannenberg, founded the new House of Brunswick-Wolfenbüttel; and his brother William founded the new line of Brunswick-Lüneburg, and so became ancestor of the House of Hanover (q.v.). The ancient ensign of the race is the white horse. Duke Frederick-William came to England in 1809, and with his 'Black Brunswickers' (so called from their uniform, in mourning for the losses at Auerstädt) entered the British service, fighting in the Peninsular war till 1813, when he returned to his duchy; in 1815 he died a soldier's death at Quatre Bras. In 1884 the succession passed to the Duke of Cumberland, son of the dethroned George V. of Hanover. As he refused to recognise the new constitution of the German empire, the imperial government declined to allow the succession to take place, and an interregnum occurred. Prince Albrecht of Prussia was elected regent by the diet, and on his death Duke Johann Albrecht of Mecklenburg (1907). After the marriage of his son Ernst August with the Kaiser's daughter, the Duke of Cumberland renounced his claims in his favour, and Ernst August's accession was permitted in 1913. He was deposed in November 1918, and a republican government was set up.

BRUNSWICK, the capital, stands on the Oker, in a level and fertile district, 143 miles WSW. of Berlin. It is supposed to have been founded in 861, by Bruno, Duke of Ostfalen; but Henry the Lion, in the 12th century, so greatly strengthened and beautified the city that he may be almost said to be its founder. In the 13th century Brunswick became a member of the Hanseatic League, and soon attained considerable commercial prosperity, but its importance declined with the decay of the League. The town is most irregularly built, with narrow and crooked streets, but possesses the advantage of an abundant supply of water. The cathedral (1173-1469), and the churches of St Martin, St Catharine, and St Andrew with its steeple 341 feet high, are among the principal

buildings; the old Rathaus is a fine specimen of Gothic, and a number of the older houses are interesting for their quaintly carved wooden fronts. In the museum are some notable antiquities and works of art by Jan Steen, Albrecht Dürer, Holbein, Rembrandt, Raphael, Guido, Ruysdael, Michelangelo, and Benvenuto Cellini. The industry of the town consists chiefly in manufactures of tin-plate, canned foods, sausages, jute, woollen and linen, leather, sewing-machines, chicory, beet-sugar, tobacco, papier-mâché, and lackered wares, and in publishing. The old fortifications have been demolished, and their site converted into pleasant promenades. A fine avenue of lindens leads to the palace, an imposing edifice rebuilt in 1869. Pop. (1871) 57,833; (1891) 101,047; (1900) 128,231; (1910) 143,562; (1919) 139,544.

Brunswick, (1) a city, port of entry, and capital of Glynn county, Georgia, on St Simon Sound, an inlet of the Atlantic, 186 miles SE. of Macon by rail. It has connection by steamer with Savannah and New York, and exports cotton and timber; naval stores are manufactured. Pop. 14,000.—(2) A town of Cumberland county, Maine, 29 miles NE. of Portland by rail, is at the head of navigation on the Androscoggin River, whose falls or rapids supply water-power for cotton, paper, and other mills. It is the seat of Bowdoin College (1794), a Congregational institution of high standing, at which Nathaniel Hawthorne and Longfellow graduated; the Maine Medical School is affiliated to it. Pop. 7000.

Brunswick, NEW. See NEW BRUNSWICK.

Brunswick Black is a varnish employed for coating over coarsely finished iron grates, fenders, &c., and is prepared by melting together asphalt, linseed oil, and oil of turpentine. For finer work, it has been superseded by Berlin Black, a similar composition of finer quality.

Brunswick Green is a pigment of very variable composition. The native varieties sometimes consist of carbonates of copper: the artificial often contain arsenite of copper, Prussian blue, indigo, or chrome yellow. A superior product is obtained by the action of sal-ammoniac on copper filings, an oxychloride of copper being produced identical with the mineral Atacamite (q.v.).

Brusa. See BROUSSA.

Brush, GEORGE DE FOREST, American figure-painter, born at Shellyville, Tennessee, 28th September 1855, studied with Gérôme at Paris. He is a good colourist, careful in composition.

Brushes. The materials used for the manufacture of brushes are, taking first those of animal origin, hog's bristles, horse-hair, strips of whalebone, and to a smaller extent goat's hair, badger's hair, fitch (polecat), sable and camel's hair. Those of vegetable origin are principally aloe fibre, called also Mexican fibre (*Agave americana*); kittul fibre (*Caryota urens*); bass or piassaba fibre (*Attalea funifera*); and coconut fibre (*Cocos nucifera*). But many other vegetable fibres, as well as esparto grass and the like, are used locally for brushes or brooms in different parts of the world. Wire brushes are used for numerous mechanical purposes, a spiral brush with steel or brass bristles, according to the material to be cleaned, is used for tube-cleaning. Flat wire brushes are used by engineers to remove scale from corroded metal, and by moulders to brush sand from castings. Such brushes are also employed in cleaning stonework.

For the stocks of the commoner kinds of brushes and brooms, native woods, such as the so-called sycamore (often called plane-tree), beech, elm, birch, chestnut, and oak, are employed, and ash for the handles of small brooms. Veneers or plates of rosewood and satin-wood, of ivory, tortoise-

shell, mother-of-pearl, xylonite, and silver adorn the backs and handles of toilet-brushes.

Bristles (q.v.), though less so than they were, are still the chief material used in the manufacture of brushes. They are so far sorted into qualities when received by the manufacturers, who separate the larger and more valuable sizes by means of steel combs with one row of vertical teeth. The largest size stick in the teeth of the first comb, the next size in the second comb, and so on. Every bundle of the better qualities yields a small proportion of long and strong bristles which have a high value, and are not made into brushes but sold to shoemakers. The bristles are also sorted by hand and a size stick or gauge into various lengths, and by the eye into various colours, as black, gray, white, and other shades. Either before or after they are sorted, bristles require to be washed, and the 'whites' are bleached with sulphurous acid or other agent (see BLEACHING). French white bristles are generally beautifully bleached.

A hair-brush may be taken as an example of how the class known as 'drawn' brushes are made. With the assistance of a perforated lead or wood

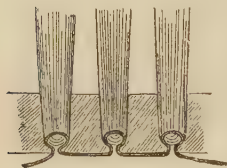


Fig. 1.

gauge the stock is drilled with holes for the tufts. These are formed by doubling the bristles, and are then drawn into their place by thin brass wire, which loops in tuft after tuft, and is continuous all through the filling of a single brush (see fig. 1, in which the bold line shows the wire). A back

which conceals this wire-looping is then glued on and otherwise fixed. It may be stated that a hair-brush has the points of the bristles of unequal length, in order to penetrate the hair. Hat-brushes and baby's hair-brushes are made of horse-hair. Brooms, bannister, and other 'set' brushes, many of which have long tufts, are made in a different way. The stocks are turned, cut to shape, and drilled with holes of the proper size, but in this style of work they are only sunk to a certain depth. The root ends of the tufts, which are also the root ends of the bristles, if they are not doubled, are first dipped into melted brushmakers' pitch, next tied with a string at the root, and again dipped into the pitch; this fixes the tuft when pushed with a certain twist of the hand into one of the holes of the stock. In some cases the stock is twisted with one hand, and the tuft held steady by the other. In this manner the broom or brush is filled with bristles.

A painter's round brush or sash tool is one of the simplest kinds of brushes, and is made in one way by fixing a bundle or tuft of bristles, previously dipped into a cement formed of rosin and linseed oil, to the end of a two-pronged wooden handle by a piece of twine, which is then coated with glue. There are other methods of binding the bristles of large round brushes, such as by an iron or copper ring, or by wire.

Whitewash and other flat brushes of similar shape consist, in some cases, of two, three, or more cylindrical brushes, placed side by side, and fastened separately on a projecting edge of a flat stock or handle. Each of these single brushes forming the compound brush is bound with twine or copper wire, the latter being now preferred. There are other kinds of the same shape differently made; one variety, for example, is merely a single brush of oblong form with the bristles held together by a strip of leather and nails; another sort is formed by tufts fixed with pitch in the manner of a hearth-broom. In those cases where the root ends of the

bristles are exposed, they are singed with a hot bar of iron. It is curious how sometimes one, sometimes another kind of these brushes is preferred for the same purpose in different districts of the country. The brushes used by artists are, for large sizes, made of hog's hair bound with tin, and for small sizes of sable and camel hair. The latter are either bound with quill or tin. A sable-hair pencil is the most costly brush for its size that is made. Softening brushes of badger's hair are used both by artists and grainers of wood.

Machine-made Brushes.—There are several kinds of mechanism in use for making brushes. The Woodbury machine, which has been extensively used in America, is perhaps the best known. Its chief parts are a comb with an arrangement for filling its divisions with bristles; a shaft to work devices by which the bristles are fed in tufts to plungers that double them, bind them with wire, and introduce them into the back of the brush; an arrangement by which the wire is fed to and through the bristles after doubling; and mechanism for centring the brush-back under the two plungers concerned in preparing and inserting the tuft. The machine is too elaborate for illustration here. Fig. 2 shows how the tufts are bound with wire, which takes the form of a spiral, and by a movement of the plunger is made to screw its way into the hole in the brush-back.

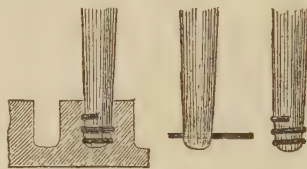


Fig. 2.

In England, machinery is chiefly applied to the manufacture of the cheaper kinds of brushes from vegetable fibres, although it is not confined to these.

The fibres have to undergo a process of preparation. The tufts in these machine-made brushes are secured in different ways, such as by a cross wire, shown in fig. 3, or by a hard steel wire loop bent into a triangular shape, and placed as in fig. 4, with the shoulders pressed firmly on the sides of the drilled hole, and the points fixed to the bottom.

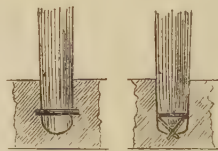


Fig. 3.

Fig. 4.

Brush Light. See ELECTRIC LIGHT.

Brush Turkey. See MOUND-BIRDS.

Brusiloff. See BRUSILOFF.

Brussels (Fr. *Bruxelles*; Flem. *Brussel*), the capital of Belgium, is situated in a fertile plain on the ditch-like Senne, 27 miles S. of Antwerp, and 193 NE. of Paris. It communicates by ship-canal with Antwerp, and is a railway centre. The city has a circumference of about 5 miles, and is built partly on the side of a hill; though some of the streets are so steep that they can be ascended only by means of stairs, Brussels may on the whole be pronounced one of the finest cities in Europe. The Upper Town is the newest and most fashionable quarter, and is the residence chiefly of the great and wealthy. The king's palace, public offices, chief hotels, and mansions of foreign ministers are here. It is also much more healthy than the Lower Town, which is greatly subject to fogs, owing to its intersection by the canals and the Senne, although the stream now passes under an arched covering, which supports a boulevard. But the closely built old streets, with their numerous handsome buildings, formerly belonging to the Brabant

nobility, but now occupied by merchants and traders, have a fine picturesque appearance, while some of the public edifices are unrivalled as specimens of Gothic architecture. This part has also several noble churches, but it is now wholly given over to trade. French is spoken in the upper division; but in the lower Flemish is prevalent, and in one quarter the Walloon dialect is spoken. The English language, owing to the large number of English who reside here for economy, is also very common. The walls which formerly surrounded Brussels have been removed, and their place is now occupied by pleasant boulevards extending all around the old town, and shaded by alleys of limes. The *Allée Verte*—a double avenue along the Scheldt Canal—forms a splendid promenade, and leads toward the country palace of *Laeken*, 3 miles north of the city. Besides the fine park in the Upper Town, covering an area of some 32 acres, ornamented with fountains and statues, and surrounded by the palace and other state buildings, Brussels has several other squares or places, among which the most noteworthy are: the *Place Royale*, with its colossal monument of Godfrey of Bouillon; the *Grand Place*, in which is situated the hôtel-de-ville, a splendid Gothic structure, erected in the beginning of the 15th century, with a spire of open stonework 364 feet high, and where, in 1568, the patriot counts, Egmont and Horn, were beheaded by order of the Duke of Alva; and the *Place des Martyrs*, where a memorial has been erected to those who fell here in the revolution of 1830. Among the churches the largest and finest is the cathedral of St Gudule, which dates from the 13th century, and is built in the pointed Gothic style, with many richly painted windows, and a pulpit considered to be the masterpiece of Verbruggen. The *Palais des Beaux Arts* contains the finest specimens of the Flemish school of painting, and a sculpture-gallery. The royal library adjoining has half a million volumes. The *Palais de Justice*, built in 1866-83 from designs by Poelaert at a cost of more than £2,000,000, is one of the most magnificent buildings in Europe. The royal palace and the national palace (for the chambers) are important buildings. There are several celebrated scientific societies, and educational institutions are both numerous and important. The university was founded in 1834. There are schools of painting and sculpture, and a conservatorium. The city contains also numerous charitable and benevolent institutions, and is the seat of the provincial government of Brabant, as well as of the general government of the kingdom. Brussels is one of the chief centres of the industry of the country. Its lace is particularly famous. Of the esteemed carpets which pass under the name of Brussels carpets, only a few are manufactured there, most of those of Belgian make being produced at Tournai. It has also manufactures of damask, linen, ribbons, embroidery, paper, jewellery, hats, soap, porcelain, mathematical and musical instruments, &c. Carriage-building is an important

branch of industry; and printing and lithographic establishments are numerous. Pop. (1846) 123,874; (1866) 157,905; (1885) 171,751; (1911) 177,078; (1920) 156,924, or with Laeken and other suburbs, some of which were annexed in 1921, 831,396.

As early as the 8th century we find *Bruchsellæ*, then probably a villa of the Frank kings, mentioned in old chronicles; and that a church existed here in 966 is proved by a deed of the Emperor Otho I. Under Charles V. Brussels was made the court-residence in the Netherlands, and became afterwards, under Philip II., the chief arena of the revolution, and of the atrocities committed by the Duke of Alva and the Inquisition. The city suffered greatly in the war of Spain against Louis XIV.—in whose reign it was bombarded by Marshal Villeroi, and upwards of 4000 buildings destroyed—and in that of Austria against Louis XV.; but still more from the continual prevalence of party animosities caused by the policy of Austria.



Palais de Justice, Brussels.

Under the mild rule of Maria Theresa it flourished greatly, and in her time many of its best institutions and public buildings were founded. In 1789 occurred the Brabant revolution under Joseph II.; and scarcely had Austrian rule been re-established, after a brief time of independence, when Brussels fell into the hands of the French (1792). After other changes of fortune, Brussels, with the other parts of Belgium, was incorporated with the kingdom of the Netherlands in 1815, and so remained until the revolution of 1830 made it capital of independent Belgium. The exhibition of 1910 is memorable for a destructive fire. In 1914-18 Brussels was in German occupation, and Burgomaster Adolphe Max, its champion, was imprisoned. See LACE, CARPETS, and *The Story of Brussels* by Smith and Kimball (1906).

Brussels Sprouts, a sub-variety of kale or cabbage, *Brassica oleracea* (*B. O. bullata gemmifera*). The buds or sprouts that cluster in the leaf-axils are highly esteemed for their delicate flavour and wholesome quality. Brussels sprouts is one of the hardiest of green winter vegetables, which, though chiefly cultivated in the gardens of the rich, is, on account of the great weight of crop it yields, and its extreme hardiness, worthy of a considerable space being devoted to it in the gardens of the poor. There are strains of the plant distinguished from each

other by greater or less tallness of stem, and by the larger or smaller size and compactness of the sprouts. As a rule, the shorter-stemmed strains have the largest and most compact sprouts, and are consequently the most favoured. Like all the cabbage tribe, it requires deep rich soil to bring it to fullest perfection. The seed is sown in the open ground in February or March, according to the character of the weather, and again in late April or May to prolong the succession of crops. Those sown in February will come into use in October or November, and the later sowings successively for about six months. Having comparatively little spread of leaves, the plants may be set more closely than most other Brassicæ, from two to two and a half feet apart each way being the usual distances allowed from plant to plant.

Brussiloff, ALEXEI ALEXEIEVICH, Russian general, born in 1856, was educated in the Corps of Pages, served in the Russo-Turkish war, and became director of the Petrograd cavalry school. In the Great War he won distinction in command of the Russian advances through Galicia in 1914-17. In June 1917 he succeeded Alexeieff as commander-in-chief under the provisional government. He is said to have been commander-in-chief also under the Bolshevik government.

Brut, or **BRUTUS**, the eponymous Trojan hero who gave his name to the island of Britain, according to Geoffrey of Monmouth, Wace, Layamon, and all the earlier historians in verse or prose. The great-grandson of Æneas, he was banished from Italy, and after many adventures, found his way to Albion, then the abode of giants, who were not destroyed without desperate fighting.

Bruttium, the country of the Bruttii, anciently the name of the south-west peninsula of Italy. See CALABRIA.

Brutus, LUCIUS JUNIUS, in the legendary history of early Rome, the hero who overturned the monarchical and established the republican form of government. The son of a rich Roman, on whose death Tarquin the Proud seized the property and put an elder brother to death, he himself only escaped the same fate by feigning idiocy, whence the name *Brutus* ('stupid'). When the popular indignation was roused at the brutal outrage upon Lucretia, he placed himself at the head of the people, and drove the royal family from Rome. He was then elected one of the two first consuls (509 B.C.). With stern justice he sentenced to death his own two sons, detected in a conspiracy to restore the monarchy; and at last fell in mortal combat repelling an attack led on by one of the sons of Tarquin.

Brutus, MARCUS JUNIUS, born 85 B.C., appears to have spent the early years of manhood in exclusive devotion to literary pursuits, and not to have taken part in the political dissensions agitating Rome till he had attained a mature age. When the civil war broke out between Pompey and Cæsar, he sided with the former, but after the battle of Pharsalia made his submission to the latter, and in the following year was appointed governor of Cisalpine Gaul. On returning to Rome he divorced his wife in order to marry Portia, the daughter of Cato, of whose principles in politics he professed to be a disciple. The influence of Cassius prevailed upon him to join the conspiracy which ended in the murder of Cæsar (q.v.). The efforts of Brutus to retain popular favour afterwards being unavailing to counteract the effects of the eloquence of Antony, he was forced to leave first Rome, and then Italy. The remainder of his life was spent partly in Athens, partly in Asia Minor, and partly as the leader of a marauding force, which maintained itself by plundering the inhabitants of the eastern

shores of the Adriatic. Defeated at Philippi (42 B.C.; see AUGUSTUS), he fell upon his sword.

Brüx, or **MOST**, a Bohemian town, 78 miles N.W. of Prague; near are coal-mines, and the Sedlitz mineral springs; pop. 26,000 (Germans).

Bruyère. See LA BRUYÈRE.

Bryan, WILLIAM JENNINGS, was born at Salem (Ill.), 19th March 1860, studied at Jacksonville and Chicago, and practised as a lawyer in Nebraska. He was elected to Congress in 1890, and in 1896 and 1900 was chosen Democratic candidate for the presidency. He advocated free coinage of silver and governmental control of railways and monopolies, was the labour candidate as against capitalists, and in his second candidature exposed expansion or imperialism, but was completely defeated by McKinley (q.v.) in 1896 and 1900, and by Taft in 1908. He was Secretary of State 1913-15.

Bryanites. See METHODISTS.

Bryant, JACOB (1715-1804), born at Plymouth, was educated at Eton and King's College, Cambridge, and in 1756 became secretary to his old pupil the Duke of Marlborough. The chief of his many works is the *Analysis of Ancient Mythology* (3 vols. 1774-76).

Bryant, WILLIAM CULLEN, a distinguished American poet and journalist, was born of good New England stock at Cummington, Massachusetts, 3rd November 1794. Trained to admire the poetry of Pope, he was early encouraged to imitate him. The most noted fruit of these attempts was *The Embargo, a Satire by a Youth of Thirteen* (Boston, 1807). In 1810 he entered Williams College, but soon resumed his studies at home, and formed himself by loving study of such poets as his favourites, Blair and Kirke White, while watching with a keen eye the quiet life of nature as he rambled among the woods. His quickened imagination found expression in the majestic blank verse of *Thanatopsis*, which, published in the *North American Review* for September 1817, was at once acknowledged to surpass in grandeur and beauty anything previously written by an American. Meantime Bryant had studied law, had been admitted to the bar, and had settled at Great Barrington. Being called to contribute further to the *Review*, he sent both verse and prose; among the former *Lines to a Water-fowl*, and among the latter a criticism on American poetry. In 1821 he delivered before the Phi Beta Kappa Society at Harvard a poem in Spenserian verse called *The Ages*. In the same year he was married to Miss Frances Fairchild, who inspired his poem *O Fairest of the Rural Maids*; but he also lost his father, to whom he paid a tribute in his *Hymn to Death*. Other noted poems of this time are: *The Rivulet*, *The West Wind*, *Green River*, *The Forest Hymn*, and *June*, which were published in Boston periodicals. In 1825 the poet was induced by his friends to remove to New York to become editor of *The New York Review*, and when it failed a year later, he was made assistant-editor of the *Evening Post*. In 1829 Bryant became editor-in-chief, and by his ability, dignity, and steady adherence to principle, did much to raise the tone of the daily press. A collection of his poems was published in 1832, and, on its republication in England through Washington Irving, received favourable notice from *Blackwood's Magazine*. Bryant was now, however, absorbed in journalism. His paper was democratic in politics, but when the slavery question became prominent it inclined to the anti-slavery side, and in 1856 it assisted in forming the Republican party. As editor of an influential paper, Bryant was often called upon to make public addresses. A volume of

these addresses was published in 1873. His visits to Europe, the West Indies, and many parts of the United States, gave occasion for letters to his paper, which were republished, making three volumes. Meantime his poems had sunk deeply into the minds of his countrymen, and several editions, some of which were finely illustrated, were issued. In his old age, when relieved of the more pressing demands of a daily newspaper, he again permitted the deeper emotions of his heart to flow in verse. The poems of his age bear striking resemblance to those of his youth; they have the same grand simplicity, transparent clearness, wide generalisation. Sometimes, as in *Robert of Lincoln* and *The Planting of an Apple-tree*, he seemed to strike off a more airy and musical lyric than ever before. At seventy-two he commenced a translation of Homer's *Iliad* and *Odyssey* in English blank verse, which proved as inadequate as that of many greater men before him. Almost his last poem was *The Flood of Years*, a noble counterpart to *Thanatopsis*. On May 29, 1878, Bryant delivered an eloquent address at the unveiling of a bust of Mazzini, in Central Park, New York. After its close, in entering a house, he fell on the doorstep, receiving injuries of which he died 12th June.

His complete works were published in 4 vols. (1883-84); his *Life* was written by his son-in-law, Parke Godwin (2 vols. 1883). See also the works on him by J. Bigelow (1890) and A. C. Bradley (1905), and the criticisms by Stedman and Barrett Wendell.

Bryce, RT. HON. JAMES, VISCOUNT (1914), O.M., was born at Belfast, 10th May 1838, and educated at Glasgow University, and at Trinity College, Oxford, where he graduated in 1862 as double first. Called to the bar in 1867, he was in 1870-93 regius professor of Civil Law at Oxford, and sat in parliament in 1880-1907. In 1886 he was made Under-secretary for Foreign Affairs, in 1892 Chancellor of the Duchy of Lancaster, in 1894-95 President of the Board of Trade, in 1905 Chief Secretary for Ireland, and in 1907-12 was ambassador to the United States. A strong home-ruler, he was active in connection with university reform, the Eastern question, commons and access to mountains, and copyright; and wrote *The Holy Roman Empire* (1864), *Transcaucasia and Ararat* (1877), *The American Commonwealth* (1888), *Two Centuries of Irish History, 1691-1870* (1888), *Impressions of South Africa* (1897), *Studies in History and Jurisprudence* (1901), *Studies in Contemporary Biography* (1903), *South America* (1913), *Modern Democracies* (1921). He died 22d January 1922.

Brydges, SIR SAMUEL EGERTON, born at Wootton House, Kent, in 1762, was educated at Cambridge and called to the bar, but retired to his country house (Denton Court) and to literature. Better than his poetry and novels were his edition of Edward Phillips's *Theatrum Poetarum Anglicanorum*, vol. i. (1800); his *Censura Literaria* (10 vols. 1805-9); and his edition of *Collins's Peerage of England* (9 vols. 1812). The claim of his family to the barony of Chandos broke down, but Brydges was gratified with a Swedish knighthood in 1808 and an English baronetcy in 1814. He represented Maidstone in 1812-18, and printed privately at the 'Lee Priory Press' small editions of many rare Elizabethan books and tracts. After 1818 he lived mostly abroad until his death near Geneva, 8th September 1837. His later bibliographical works were the *British Bibliographer* (4 vols. 1810-14); *Restituta* (4 vols. 1814-16); and *Excerpta Tudoriana* (2 vols. 1814-18). His *Autobiography* was published in 1834.

Bryennios, PHILOTHEOS, theologian, born at Constantinople in 1833, studied at home and in Germany, and presided over the great Greek school

in Constantinople from 1867 to 1874. He was one of two representatives of the Greek Church at the Old Catholic conference in Bonn in 1875, and while absent there was chosen Metropolitan of Serrae in Macedonia. In 1877 he was translated to Nicomedia. Bryennios is known as editor of the *Epistles of Clement* (q.v.) and discoverer of the *Didachē* (see APOSTLES, TEACHING OF THE).

Brynnawr, a place in Brecknockshire, 8 miles WSW. of Abergavenny, with ironworks; pop. 8000.—For Bryn Mawr College near Philadelphia, U.S., see WOMEN'S RIGHTS.

Bryology, the study of Mosses (q.v.).

Bryony (*Bryonia*), a genus of Cucurbitaceae (q.v.), of which the Common Bryony (*B. dioica*) is the only British species. It is frequent in hedgerows in England, but becomes rarer in the north, and is not indigenous to Scotland. It has cordate palmate leaves, axillary bunches of flowers, and red berries about the size of a pea. It abounds in a fetid and acrid juice. The root-stock is perennial, very large, white and branched, has a repulsive smell, and is acrid, purgative, and emetic, owing to the presence of a bitter and poisonous



Common Bryony (*Bryonia dioica*):
a, flowering, and b, fruiting branch.

alkaloid, *bryonin*. *B. alba*, which is monœcious, with black berries, is common in Central Europe, and possesses similar properties. The root of both is applied to bruises, was formerly in use as a purgative, and its tincture is still employed in homœopathic and veterinary practice. The young shoots of both species are free from acrid and dangerous qualities, and are sometimes used as pot-herbs, especially in Eastern Europe.—The roots of other species of the genus are also acrid and purgative; and are used medicinally in India; but it is said that the root of *B. abyssinica*, when cooked, is eaten without danger.—*B. boykinii* is a species found native in the southern United States.—Black Bryony (*Tamus communis*) is a plant of a different natural order (Dioscoreæ, q.v.). Its habit and distribution is similar to that of Bryony proper, but it may be readily distinguished by its simple entire heart-shaped leaves, which are smooth and somewhat glossy. The flowers are small and greenish, and the berries red, the root-stock very large and fleshy, black externally. The berries are unwholesome, and the whole plant is acrid, the roots so much so as to have been formerly employed for stimulating plasters. But the young suckers, in which the acrid principle is not

much developed, may be eaten like asparagus, after careful boiling with change of water.

Bryophyllum (Gr. *bryon*, 'blossom,' and *phylon*, 'leaf'), a genus of Crassulaceæ (q.v.). *B. calycinum*, a succulent shrubby plant, a native of the Moluccas, with oblong, crenulated leaves, and large drooping panicles of greenish-yellow flowers, is not unfrequent in British and other hothouses, being regarded as an object of interest on account of its producing buds on the edges of the leaves more readily than almost any other plant, especially when the leaf is pegged down upon the soil, the buds then at once forming independent plants. The same habit is exhibited by the British *Bogorchis* (*Malaxis paludosa*), by some species of ferns, &c. The leaves are valued for poulticing in the East. See BUD and LEAF.

Bryophyta. See LIVERWORTS, MOSSES.

Bryozoa. See POLYZOA.

Bryum, a large genus of common Mosses (q.v.). They are all small, and generally grow in dense patches of a beautiful bright green.

Brześć-Litewsk. See BREST LITOVSK.

Brzezany, a town of Eastern Galicia, situated on the Złota-Lipa, 52 miles SE. of Lemberg. It has manufactures of cloth, leather, meal, beer, and brandy. Pop. 12,000 (about half Jews).

Buache, PHILIPPE, a French geographer, born 1700, became in 1729 royal geographer, in 1730 a member of the Academy of Sciences; died in 1773. He published both atlases and geographical works.—His nephew, Jean Nicolas Buache (1741–1821), was also a celebrated geographer.

Buaze (*Securidaca* (*Lophostylis*) *longifolia* and *angustifolia*) is a Polygalaceous shrub found by Livingstone north of the Zambesi, where its twigs are employed as a source of fibre, which much resembles flax.

Bubalis, a genus in the Antelope division of hollow-horned even-toed Ruminants, not to be confused with the genus *Bubalus*—the Buffalo (q.v.). The species of *Bubalis* are among the more ox-like antelopes, and one of them is supposed to be the *Bubalus* of the ancients. In this genus the head is elongated, the snout broad, the horns twisted and present in both sexes, the tear-pits small, the back sloping off behind, the teats two in number.



Bubalis.

The Bubaline of the North African deserts (*B. mauretanica* = *Antelope bubalis*) is a handsome animal of a reddish-brown colour, standing about 5 feet high at the shoulder, living in herds, and readily tamed. It is figured on Egyptian monuments. The Hartebeest (*B. caama*) is found in

the south, is perhaps slightly larger, has a general gray-brown colour (black on the outside of the legs and on middle of forehead, with large white spots on haunches), and is at home on the mountains. The Sassaby (*B. lunata*), the Bastard Hartebeest of the Cape, is slightly smaller, and is differently coloured. The Bontebok (*B. pygarga*) is a smaller and more beautifully coloured form of the southern interior, where another species, the violet-coloured Blesbok, is also abundant. See ANTELOPE.

Bubastis (the *Pi-beseth* of Ezek. xxx. 17; now *Tel Bast*), a ruined city of Lower Egypt, on the eastern main-arm of the Nile, near Zagazig, named from the lion-headed and cat-headed goddess Bast, who was worshipped here with peculiar reverence. She was daughter of Ra, and bride of Ptah, and symbolised sexual passion. Her festival took place on the 16th of Khoiak (about Christmas). Bast (also called *Menk*) and Sekhet were regarded as sisters. Under the 25th dynasty (725–686 B.C.) the city was a royal residence, but after the Persian conquest (525 B.C.) it gradually lost its importance. The ruins of its great temple were discovered by M. Naville in 1887, and extensive excavations next year revealed that Bubastis was once the seat of a great Hyksos settlement.

Bubble Shell. See BULLA.

Bubo. See OWL.

Bubo, an inflammatory swelling of the glands in the groin; used occasionally also of the armpit. See GONORRHOEA, INFLAMMATION, PLAGUE.

Buccaneers (through the Fr. verb *boucaner*, and noun *boucanier*, from Caribbean *boucan*, 'smoke-dried meat'), a name given to the celebrated associations of piratical adventurers, who, from the commencement of the second quarter of the 16th century to the end of the 17th, maintained themselves in the Caribbean seas, at first by systematic reprisals on the Spaniards, latterly by less justifiable and indiscriminate piracy. The arrogant assumption by the Spaniards of a divine right to the whole New World, and their consequent exclusive monopoly of trade, could not of course be tolerated by the enterprising mariners of England and France, who began to band themselves together for mutual defence, and for the plunder of the common enemy. In 1625 an attempt was made to found a settlement on the island of St Christopher as a centre of smuggling enterprise with San Domingo, and in 1630 the small island of Tortuga was seized and converted into a stronghold. From this the buccaneers made their incursions against the Spaniards, and here they stored the gains of their roving adventurous life. Their earlier history shows that they had a rude honour and fidelity in their relation with one another, which attracted to their flag hundreds of adventurous spirits from every European trading nation. Tortuga was taken and retaken by the Spaniards, but the capture of Jamaica in 1655 finally gave the buccaneers a surer footing. Their power had now become considerable, and their seamen were as famous for their desperate courage as for their consuming hatred of the Spaniards. Their history embraces narratives of cruelty and bloodshed hardly to be surpassed in the annals of crime, but is brightened by many a story of high and romantic adventure, of chivalrous valour, and brilliant generalship. Among the 'great captains' whose names figure most prominently in the records of buccaneering were the Frenchman Montbars, surnamed by the terrible title of 'The Exterminator'; Peter of Dieppe, surnamed 'The Great'—as truly, perhaps, as many others so distinguished; L'Olonois; Michael de Busco and Bartolomeo de Portuguez; Mansvelt, and Van

Horn. Pre-eminent, however, among them all was the Welshman, Henry Morgan, afterwards knighted by Charles II. and made deputy-governor of Jamaica, a man of rare capacity and courage. He it was that led the way for the buccaneers to the Southern Ocean, by his daring march in 1671 across the Isthmus of Panama to the city of that name, which he took and plundered after a desperate battle. In 1680 they crossed the Isthmus of Darien and seized some Spanish vessels in the Bay of Panama, after which some returned, but others cruised for months through the South Sea, coming back with enormous wealth to the West Indies by Cape Horn. Other expeditions followed, whose ravages almost paralysed the Spanish trade in the Pacific. In 1685, when their fleet defied the Spanish power in the Bay of Panama, their glory was at its height. The strange confederacy now began to fall to pieces under the jealousies that grew up with wealth and greater security; and the next stages in their history are disunion, decay, and extinction. The war between France and Britain, after the accession of William III., dissolved the ancient alliance of the French and English buccaneers. After the Peace of Ryswick, and the accession of the Bourbon Philip V. to the Spanish crown (1701), the buccaneers finally disappeared to make way for a race of mere cut-throats and vulgar desperadoes, who lacked the greatness of their predecessors. The last event in their history was the capture of Cartagena in 1697, where the booty was enormous. See Dampier's *Voyages*; the *Narratives of Wafer, Ringrove, and Sharp*; Captain Burney's *History of the Buccaneers of America* (1816); Thornbury's *Monarchs of the Main* (1855); Powell's edition (1893) of Esquemeling's *Buccaneers of America*; C. H. Haring's *Buccaneers of the West Indies in the 17th Century* (1910).

Buc'cari, or BAKAR, a small port of Croatia, on an inlet of the Gulf of Quarnero, 5 miles by rail ESE. of Fiume. Pop. 2000.

Buccinator (Lat. from *buccinare*, 'to sound a trumpet'), the name of a flat muscle in the cheeks, so called because, when the cheeks are distended with air, the contraction of the buccinator muscles forces it out.

Buc'cinum. See WHELK.

Buccleuch, a small Selkirkshire glen, 18 miles SW. of Selkirk, with the site of an early stronghold of the Scotts, to whom it gave the title of earl (1619) and duke (1663). See SCOTT.

Bucen'taur (Ital. *bucentoro*), the name of the state-galley in which the former Doges of Venice used to sail out every year on Ascension-day, amid great festivities, in order, by sinking a ring into the sea, to wed it in token of perpetual sovereignty. The word signifies a monstrous figure of half bull, half man, such as may originally have been depicted on the vessel. The ceremony was already in use in the 13th century; in 1798 the last Bucentaur, built in 1722-28, was burned by the French, but some portions, spared for their gold work, are still preserved in the arsenal.

Buceph'alus (Gr. 'ox-head'), the name of the favourite charger of Alexander the Great, was probably also the name of a peculiar breed of horses in Thessaly. The young hero was the first to break in the steed, and thus fulfilled the condition stated by an oracle as necessary for gaining the crown of Macedon.—The town BUCEPHALIA, on the river Hydaspes (Jhelum), in India, was founded near the grave of Bucephalus, who died during Alexander's Indian expedition.

Bucer, or BUTZER, MARTIN, reformer, was born in 1491 at Schlettstadt, in Alsace. At the age of fourteen he entered the Dominican order, and

went to Heidelberg to study theology, Greek, and Hebrew. In 1521 he quitted the order, and was appointed chaplain to the Elector-Palatine, an acquaintance with the works of Erasmus having already inclined him towards Protestantism. He married a former nun in 1522, and next year settled in Strasburg. In the disputes between Luther and Zwingli, Bucer adopted a middle course, and endeavoured to reconcile them; but his view of the sacraments, which approached that of Zwingli, exposed him to Luther's harsh reprobation. At the Diet of Augsburg, where he conducted himself with great circumspection and moderation, he generally accorded with the Lutheran views, but, along with other Strasburg theologians, declined to subscribe to the proposed confession of faith, and afterwards drew up the *Confessio Tetrapolitana* (1530). At Wittenberg, however, an agreement was in 1536 entered into between Bucer and the Lutherans. In consequence of his refusal to sign the *Interim* (q.v.) in 1548, Bucer found his situation irksome in Germany, and therefore accepted Cranmer's invitation (1549), and came to England to teach theology at Cambridge, and assist in forwarding the Reformation. His modesty, blameless life, and great learning gained many friends in England; but his labours were soon terminated by death, February 27, 1551. His remains were interred in St Mary's, Cambridge, with great solemnity, but during Mary's reign were exhumed and burned in the market-place. Bucer's constant attempts to express himself in language agreeable both to Luther and Zwingli, induced in him at times an obscure and ambiguous style, and Bossuet stigmatised Bucer as 'the great architect of subtleties.' His work, a translation and exposition of the Psalms, he published under the pseudonym Aretinus Felinus (1529). Lenz edited (1880) his correspondence with the Landgrave of Hesse, whose 'second' marriage Bucer defended.

See Baum, *Capito und Butzer* (1860); Tollin, *Servet und Butzer* (1880); the article by Sir A. W. Ward in the *Dictionary of National Biography*; the bibliography by Mentz and Erichson, published on his jubilee in 1891; and the book on him by A. Lang (Leipzig, 1900).

Buch, LEOPOLD VON, German geologist, was born at Schloss-Stolpe, near Angermünde, in 1774, and received instruction under Werner at the Mining Academy, Freiberg. He afterwards travelled in pursuit of his favourite science, through all the states of Germany, through Scandinavia as far as the North Cape, and through several parts of Great Britain, France, and Italy, visiting the Canary Islands in 1815. He strenuously upheld the now exploded theory of 'Elevation Craters,' according to which volcanic mountains have been formed by a single sudden swelling-up into a hollow bladder of previously existing horizontal beds of lava and scoriae. He died in Berlin, March 4, 1853. His collected works fill 4 vols. (1867-85).

Buchan, the north-east district of Aberdeenshire (q.v.), lying between the Ythan and the Deveron. It rises in Mormond Hill to 769 feet; portions of the coast are bold and precipitous, and 6 miles south of Peterhead are the famous Bullers of Buchan, a huge vertical well in the granite margin of the sea, 50 feet in diameter and 100 feet deep, into whose bottom the sea rushes by a natural archway. Buchan contains the towns of Peterhead, Fraserburgh, and Turriff, besides the remains of the Abbey of Deer, and of several castles of the Comyns, who held the earldom of Buchan, but forfeited their title and property in 1309. See Pratt's *History* (1859), and the *Book of Buchan*, ed. Tocher (1910). Buchan Ness is the easternmost promontory of Scotland, 3 miles S. of Peterhead.

Buchan, DAVID, explorer, born in 1780, held a lieutenant's commission in the British navy in 1806, and in 1810 was in command of a schooner on the Newfoundland station. He explored the river Exploit (1811), and penetrated 160 miles into the interior. Promoted commander in 1816, he was two years later appointed to the command of a Polar expedition, at the same time as Ross and Parry started on their voyage in search of a north-west passage. Buchan reached Spitsbergen with the *Dorothea* and *Trent*, but all attempts to pierce the gigantic icy barrier were in vain. On his return he commanded for a time on the Newfoundland station, was appointed high-sheriff of Newfoundland (1825), and a few years later sailed northward again, and never returned. His name was removed from the list of living captains in 1839.

Buchan, ELSPETH. See BUCHANITES.

Buchan, PETER, an industrious collector of Scottish ballads, was born at Peterhead in 1790. At twenty-four he published an original volume of verse, next taught himself copper-engraving, and after learning the art of printing at Stirling in ten days, set up a press at Peterhead (1816). He afterwards removed to London, but returned after two years to Peterhead, where by his business he made money enough to buy a property in Stirlingshire. He died in London, September 19, 1854. Buchan's *Ancient Ballads and Songs of the North of Scotland* was published at Edinburgh in 1828. It contained about forty new ballads, and many fresh versions of ballads printed elsewhere. A second collection was edited for the Percy Society in 1845 by J. H. Dixon. Buchan wrote many books, among them *Annals of Peterhead* (1819), and *The Eglinton Tournament and Gentleman Unmasked* (Glasgow, 1839).

Buchan, WILLIAM, physician, was born in 1729 at Anerum, Roxburghshire, and studied divinity and medicine in Edinburgh. He settled in Sheffield, but removed to Edinburgh about 1766, where he practised and lectured on natural philosophy. His *Domestic Medicine*, perhaps the most popular book of its kind ever issued, appeared in 1769. Its success was great and immediate, 19 large editions, amounting to 80,000 copies, being sold during Buchan's lifetime. He removed to London in 1778, died 25th February 1805, and was buried in Westminster Abbey. Buchan was also author of works on *Cold Bathing* (1786), *Diet* (1797), and *Offices and Duties of a Mother* (1800).

Buchanan, CLAUDIUS, born at Cambuslang, near Glasgow, 12th March 1766, studied for two years at Glasgow University, and afterwards, through the influence of the Rev. John Newton, at the university of Cambridge (1791-95). From 1797 he was a chaplain in the East India Company's service at Barrackpur, where he studied Hindustani and Persian; in 1799 he removed to Calcutta, and became vice-provost of the college founded by Lord Wellesley at Fort William. He translated the Gospels into Persian and Hindustani, and made two tours through southern and western India; but debarred as a chaplain from directly engaging in missionary enterprise, he returned in 1808 to England. There, by his sermons and his periodical, *The Star of the East*, he excited so much popular interest that the government took his side, and before his death, February 9, 1815, the first English bishop had been appointed to Calcutta. See his *Life* by Pearson (3d ed. 1819). His *Christian Researches in India* was published in 1858.

Buchanan, GEORGE, the most distinguished scholar whom Scotland has produced, and one of the most brilliant representatives of the intellectual and religious movements of his age, was born of parents poor, but of good descent, at

Killearn, in the county of Stirling, in February 1506. Buchanan received the rudiments of his education in Scotland; but at the age of fourteen was sent by an uncle to the university of Paris, where his chief study was the composition of Latin versé. The death of this uncle who had supported him, as well as the state of his own health, forced Buchanan at the end of two years to return to Scotland. After nearly a year's illness, he enlisted in a force led by the Duke of Albany against England; and from the hardships of this campaign his health again suffered severely. In 1524 he matriculated as a *pauper* student at St Andrews, and the next year took the degree of B.A. In 1526 he returned to France, took the degree of M.A. at the university of Paris, and after two years' great privations, was appointed professor in the college of Ste Barbe. About this time, also, he was engaged as tutor to the son of the Earl of Cassilis; and on his pupil's return to Scotland, probably about 1535, Buchanan accompanied him. On the termination of this engagement, he was intrusted by James V. with the education of one of his illegitimate sons. To this period belong Buchanan's two satires against the Franciscans, the *Somnium* and *Franciscanus*, the latter prompted by the king himself, who, nevertheless, was either unable or unwilling to shield Buchanan from the anger of the Order. Buchanan was imprisoned with the connivance of James; but, having made his escape, also with James's connivance, he fled to England, whence, after a short stay, he proceeded to Paris (1539). Finding Beaton here, he hastened to Bordeaux on the invitation of André de Gouvéa, the head of the college in that city, and in that college acted as one of the professors for the next three years. During his stay here Buchanan wrote and translated several plays, mainly with the object of weaning the tastes of the students from the allegorical representations so popular at that time. In 1542 he had to flee from Bordeaux on account of a satire he wrote against the clergy, and thereafter for some years taught in various schools in France, among others the Collège Cardinal le Moine, Paris. In 1547, again through Gouvéa, he was appointed professor in the newly founded university of Coimbra, in Portugal. Gouvéa, however, dying shortly afterwards, the Jesuits, who were supreme in Portugal, had him imprisoned in the dungeon of the Inquisition in Lisbon on a charge of heresy. After a year's imprisonment, he was confined in a monastery, where he composed his famous Latin version of the Psalms. On his release he shortly afterwards proceeded to England, and thence again returned to France towards the end of 1552. In 1555 he was appointed tutor to the son of the famous Maréchal de Brissac, an engagement which he held for five years. Now a Protestant, Buchanan returned to Scotland, and never again left it for a lengthened period. The notices we have of him during this last period of his life show that he played an important part in public affairs. Immediately on his arrival in Scotland, he became classical tutor to Queen Mary, and to her he dedicated his completed version of the Psalms. In 1566 Murray appointed him principal of St Leonard's College, St Andrews; and during three successive years he was chosen one of the four electors of the rector. As a Protestant he took the side of the Protestant lords in their conflict with Queen Mary, against whom he wrote his notorious *Detectio*, in which he vehemently charged her with the murder of Darnley. Ten days after Mary's imprisonment in Lochleven, Buchanan was chosen moderator of the General Assembly that met in Edinburgh, June 25, 1567; and the next year he accompanied Murray to the celebrated Conference of York, where the question of Mary's

part in Darnley's murder was brought before the commissioners of Elizabeth, with no definite result. During the regency of Lennox, Buchanan was appointed tutor to the young king, James VI. In after-years James spoke with pride of his great teacher, though his feeling towards him had more in it of respect than affection. In 1570 Buchanan was made keeper of the Privy Seal, an office that entitled him to a seat in parliament. He resigned this post in 1578, and devoted his remaining years to the completion of his *History of Scotland*, which was published just thirty days before his death. He died on the 28th of September 1582, and was buried in Greyfriars' Churchyard, Edinburgh, at the expense of the city.

In his own day, Buchanan had a European reputation, which rested mainly on his skill in Latin poetry. This was an exercise in which all his learned contemporaries vied with each other; and by their unanimous admission, Buchanan was on this ground without a rival. The publication of his *History of Scotland* was looked forward to as an event in the history of letters. The only part of this history which still retains a certain importance is that which deals with the events of his own time. Of these, indeed, his account is that of a strong partisan; but it is also the account of a practical statesman and a far-seeing observer. Buchanan's influence subsequent to his death was chiefly through his tract *De Jure Regni*. In this tract, written in the form of a dialogue between himself and a brother of Maitland of Lethington, he states with the utmost boldness the doctrine that kings exist by the will, and for the good, of the people. Buchanan's teaching on this point had a most powerful influence on many statesmen who took a leading part in the great political movements of the 17th century. For continental scholars and men of letters of his own age, Buchanan was the most distinguished person then living in Britain. He may, indeed, be fairly regarded as the most brilliant British humanist of the 16th century. As in the case of Erasmus, the reformer and the humanist were in Buchanan pretty well mixed. Up till his final return to Scotland, the humanist distinctly predominated. All through his life, indeed, he wrote against the monks; but it was not so much their false doctrine that offended him, as their ignorance and brutality. Moreover, much of his verse written during this period reveals a view of life far more suggestive of the irony of the humanist than the zeal of a religious reformer. It has been matter of dispute whether the subjects of his erotic verses were real persons or not; but some lines in one of his later poems seem clearly to prove that they were imaginary. On his return to Scotland, politics and religion gradually occupied more and more of his thoughts; yet it is a mistake to suppose that he ever became a politician or a reformer of the type of Knox or Andrew Melville. Our information regarding Buchanan is insufficient to enable us to form a distinct idea of the minuter shades of his character; but we can have no doubt that his personality was of the most commanding order. He had the reverence and affection of men themselves eminent for genius and virtue; while, by those opposed to him in politics and religion, he was spoken of as a monster of vice and ingratitude.

See D. Irving, *Life and Writings of Buchanan* (1807); Hume Brown, *George Buchanan, Humanist and Reformer* (1890); George Buchanan, *Glasgow Quatercentenary Studies* (1907). His *Vernacular Writings* were edited by Hume Brown (S. T. S. 1892).

Buchanan, JAMES, fifteenth president of the United States, was born near Mercersburg, Pennsylvania, April 23, 1791, the son of an immigrant Irish farmer. He was educated at Dickinson Col-

lege, and in 1812 was admitted to the bar, where he enjoyed a large practice. He served in the state legislature (1815-16), and in congress (1820-31). In 1832 he was sent as envoy-extraordinary to negotiate the first commercial treaty with Russia; and in 1833 he was elected a member of the United States senate, in which he sat till 1845. Appointed by President Polk, in March 1845, secretary of state, he held that office till the close of Polk's presidency, and by his firmness succeeded in settling the Oregon boundary question on lines satisfactory to the United States. Buchanan was ambassador to England from 1853 to 1856, and in the latter year, on the nomination of the Democratic party, he was elected president. During his administration the slavery question drew to a head. Buchanan himself was strongly in favour of the maintenance of slavery; his cabinet was largely made up of advocates of the system; and he freely supported the attempt to establish Kansas as a slave state. As the close of his term approached, it became evident that a conflict was impending, and the election of Lincoln precipitated the outbreak; on the 20th of December, South Carolina formally seceded. The president declined to reinforce Fort Sumter; but neither would he withdraw its garrison, and his cabinet, partaking in the sectional differences, hurriedly broke up. The closing days of his administration were marked by a supineness which facilitated the movements of the party of secession, by whom most of the forts and arsenals in the disaffected states were seized during the winter. After his retirement from office, Buchanan took no part in public affairs; but he published in 1866 a defence of his administration. He died June 1, 1868. See his *Life* by G. T. Curtis (1883), and his works (1900-10).

Buchanan, ROBERT, 'the poet of revolt,' was the son of a Glasgow socialist and journalist, but was born at Caverswall, near Longton, in Staffordshire, on the 18th August 1841. He was educated at Glasgow University, where his closest friend was the short-lived David Gray (q.v.). In 1860 the two set out for London to set the Thames on fire; but gloom and poverty hung over their steps. Buchanan's first work, *Undertones*, a volume of verse, published in 1863, was well received. The *Idylls and Legends of Inverburn* followed in 1865, and next year *London Poems*, the latter his first distinct success, and indeed a rare combination of lyrical vigour and insight into humble life, lightened up with humour and sweetened with pathos. Later volumes of verse are a translation of Danish ballads and *Wayside Posies* (1866); *North Coast Poems* (1867); *Napoleon Fallen: a Lyrical Drama* (1871); *The Drama of Kings* (1871); *Ballads of Love, Life, and Humour* (1882); and *The City of Dream* (1888). His article under the pseudonym of 'Thomas Maitland' on 'The Fleshly School of Poetry,' in the *Contemporary Review* for October 1871, earned an unhappy notoriety. Rossetti answered the attack on himself in a famous letter to the *Athenæum*; Mr Swinburne's scathing pamphlet, *Under the Microscope* (1872), followed, and eventually Buchanan withdrew the main part of his charge. Notable among his novels were *A Child of Nature* (1879), *God and the Man* (1881), *The Martyrdom of Madeline* (1882), and *Foxglove Manor* (1884). He was successful as a dramatist with *A Nine Days' Queen*, *Lady Clare*, *Storm-beaten*, *Sophia* (an adaptation of *Tom Jones*), and *Alone in London*, a well-known melodrama. His latest poems, *The Outcast* and *The Wandering Jew* (1893), attacked Christianity. A collected edition of his poems appeared in 1885. He died 10th June 1901; and his *Life* by his sister-in-law, Miss Harriet Jay, appeared in 1903.

Buchanites, an extraordinary sect of fanatics which sprang up in the west of Scotland in the last quarter of the 18th century. Its founder was Elspeth Buchan, born in 1738, the daughter of John Simpson, a wayside innkeeper near Banff. She married Robert Buchan, a potter, but ultimately separated from him, having begun meanwhile to preach strange religious doctrines which she professed to find in the Scriptures. At Irvine she became acquainted with the Rev. Hugh White, minister of the Relief Church there, a weak and vain man, who adopted her opinions, for which he was deposed by his presbytery. A few followers joined them, but the magistrates expelled her from the town in May 1784. Accompanied by White and a handful of crazy fanatics, she travelled towards Nithsdale, and found a resting-place in a barn at New Cample, near Thornhill. Their whole number was forty-six, and here they built for themselves a house of one apartment with a loft, in which they all dwelt, supported chiefly by the money of the more wealthy of their number. Mrs Buchan, who gave herself out as the woman of Rev. xii., seems to have been rogue as well as fool, for with all her other-worldliness she had a very mundane interest in money, and could hardly have herself believed in the bogus miracles she wrought. The poet Burns in a letter (August 1784) speaks of the idleness and immorality of her followers. They seem to have had a community of women. Mrs Buchan died in May 1791, and was buried clandestinely by White. The last survivor of her sect died in 1848. See *The Buchanites from First to Last*, by Joseph Train (Edin. 1846).

Bucharest (*Bucuresci*), the capital of the former principality of Wallachia and of the present kingdom of Rumania, stands 265 feet above sea-level, in the fertile but treeless plain of the small, sluggish Dambovitza. By rail it is 716 miles SE. of Vienna, 40 N. of Giurgevo on the Danube, and 179 NW. of Varna on the Black Sea. A strange meeting-point of East and West, the town as a whole is but meanly built. An elaborate system of fortification was undertaken in 1885. There are some handsome hotels; and the metal-plated cupolas of the innumerable churches give to the place a picturesque aspect. The royal palace was rebuilt in 1885; and the Catholic cathedral is a fine edifice of 1875-84. The number of cafés and gambling-tables is excessive; and altogether Bucharest has the unenviable reputation of being the most dissolute capital in Europe, with all the vices but few of the refinements of Paris. There is, however, a university, founded in 1864. The *corso*, or public promenade, is a miniature Hyde Park. Chief articles of commerce are textile fabrics, grain, hides, metal, coal, timber, petroleum, and cattle. Its manufactures are unimportant, and the workmen are chiefly Hungarians and Germans. Bucharest has been several times besieged, and between 1793 and 1812 suffered twice from earthquakes, twice from inundations, once from fire, and twice from pestilence. It fell to the Germans in December 1916. At Bucharest in 1812 a treaty was concluded between Turkey and Russia, by which the former ceded Bessarabia and part of Moldavia; in 1886 the treaty between Serbia and Bulgaria was made there; by that of 1913 Rumania gained Bulgarian Dobrudja; by that of 1918 lost it again for a time, with other territory, to Bulgaria and her allies. Pop. (1866) 141,754; (1892) 196,372; (1910) 293,435; (1917) 308,987.

Buchez, PHILIPPE BENJAMIN JOSEPH, a French physician and publicist, was born 31st March 1796, at Mortagne in Ardennes. After his studies at Paris, he took part in several of the secret plots against the Bourbons, and as a St Simonist edited

for some time the communist journal, *Le Producteur*. After the revolution of 1830, he established and conducted the journal *L'Européen*, as an organ of Neo-Catholicism, and, in concert with M. Roux Lavergne, began the *Histoire Parlementaire de la Révolution Française* (40 vols. 1833-38). His *Introduction à la Science de l'Histoire* had already appeared in 1833, and was followed by his *Essai d'un traité complet de Philosophie, au point de vue du Catholicisme et du Progrès* (3 vols. 1839-40). After the revolution of February 1848, Buchez was made president of the National Assembly; but his want of energy during the disturbance of May 15 cost him all political influence. On the establishment of the Empire, he returned to his studies. He died 12th August 1865.

Büchner, LUDWIG, physician and materialist philosopher, was born at Darmstadt, where his father was a doctor, 29th March 1824. He studied at Giessen, Strasburg, Würzburg, and Vienna. He became a lecturer at Tübingen University, and in 1855 published *Kraft und Stoff* (14th ed. 1876; Eng. trans. *Force and Matter*, 1870), in which he attempted scientifically to establish a materialistic view of the universe. A violent controversy was raised; and Büchner saw himself compelled to resign his university post, and begin medical practice in Darmstadt. He wrote much in periodicals on physiological and pathological subjects, as also in support of his atomistic philosophy; published *Natur und Geist* (1857; 3d ed. 1876), *Aus Natur und Wissenschaft* (1862), as well as works on Darwinism, the idea of God, the intelligence of animals; and translated Lyell's *Antiquity of Man* (1864). He died 2d May 1899.—His brother, GEORGE (1813-37), also a doctor by profession, made a name for himself as a poet; and his sister, LUISE (1823-77), was a poetess and novelist.

Buchu. See BUCKU.

Buck, a name sometimes distinctively appropriated to the adult male of the Fallow Deer (q.v.), the female of which is a *Doe*. But the term is often also applied to the male of other species of deer, as of the Roebuck (q.v.), although never to that of the Red Deer (see DEER), which, when mature, is a Stag or a Hart.

Buckau, a manufacturing town of Prussian Saxony, incorporated in 1887 with Magdeburg (q.v.), of which it was a suburb.

Buck-bean, or MARSH TREFOIL (*Menyanthes trifoliata*), a species of Gentianaceæ (q.v.), widely



Buck-bean (*Menyanthes trifoliata*):
a, fruit; b, a flower.

distributed in all the colder parts of the northern hemisphere, common in Britain, and not rare in the northern parts of the United States and in Canada. It is easily recognised by its trefoiled leaves, and its small white or pink shaggy flowers.

These are dimorphic, like Primrose (q.v.) or Lythrum. It grows in marshy places, its creeping root-stocks and densely matted roots often rendering boggy ground firm. It is a traditional tonic and febrifuge in rustic and veterinary medicine, especially in Germany, and is also sometimes employed to give bitterness to beer. The root-stock was formerly used as a source of starchy food in Northern Europe.

Buck-eye, an American name for the species of horse-chestnuts (*Æsculus*, *Pavia*), more especially *Æ. glabra* and its varieties. *Pavia rubra* is known as red buck-eye, *Æ. flava* as sweet buck-eye, &c. See HORSE-CHESTNUT.

Buckhound, a name applied to a variety of staghound, of which a royal pack existed until 1897. The mastership of the Buckhounds, abolished in 1901, was held by a nobleman who went in and out with the government. From 1366 till 1633 the mastership was hereditary in the Brocas family. See the monograph on the family by Burrows (1886), and histories of the hunt by J. P. Hore (1894) and Lord Ribblesdale (1898).

Buckhurst, LORD. See SACKVILLE.

Buckie, a fishing-town and police burgh of Banffshire, Scotland, 13 miles ENE. of Elgin by rail. 'The largest purely fishing-village' in Scotland, Buckie is the head of the fishery district from Banff to Findhorn. The harbour has been considerably improved. Pop. 9000.

Buckingham, a municipal borough in Buckinghamshire, almost encircled by the Ouse, is 61 miles NW. of London. An ancient place fortified by Edward the Elder (918), it yet has no antiquities, owing to a great fire in 1725. Since 1848 Aylesbury has superseded it as the assize town, and it lost its last member in 1885. The church (1781) was restored by Sir Gilbert Scott, who was born close by; and there are a town-hall of much the same date, and a grammar-school founded in 1548. The bobbin-lace manufacture has declined. Pop. 3000. Stowe House, the princely seat of the Dukes of Buckingham, 3 miles to the north-west, was rebuilt towards the close of the 17th century, and became a public school in 1923. William Giffard became Earl of Buckingham in the reign of William I. The same title was conferred on the youngest son of Edward III. For the first dukes of Buckingham, see below. In 1784 George Grenville, Earl Temple, became Marquis of (the town of) Buckingham, and in 1822 his son became Duke of Buckingham and Chandos. The title of Duke of (the county of) Buckingham was conferred in 1703 on John Sheffield (q.v.), Marquis of Normanby. His town house was bought by George III. in 1761, and became Buckingham Palace. (In 1746 the quite distinct title of Earl of Buckinghamshire was conferred on Sir John Hobart. Under the sixth earl in 1878 the name became Hobart-Hampden; the seventh added Mercer-Henderson.)

Buckingham, GEORGE VILLIERS, DUKE OF, second son of Sir George Villiers, was born at his father's seat of Brooksby, Leicestershire, in 1592. In 1614 he was brought under the notice of James I., and was soon received into high favour, as successor to the Earl of Somerset. He was knighted, raised to the peerage as Viscount Villiers in 1616, and became Marquis of Buckingham in 1618. Well-paid offices and rich lands were heaped on him so profusely, that, from a threadbare hanger-on at court, he became, with a single exception, the wealthiest noble in England. In 1620 he married the daughter of the Earl of Rutland, the richest heiress in the kingdom. In 1623, while the Spanish match was in progress, Buckingham persuaded Charles to go himself to Madrid and

prosecute his suit in person. The ultimate failure of the negotiations was greatly owing to Buckingham's arrogance. Both Charles and Buckingham returned from Spain in fierce wrath against that power. In his absence Buckingham was created a duke, and on his return nominated Lord-Warden of the Cinque Ports. He carried on the negotiation for the marriage of Charles with the Princess Henrietta of France; and on Charles's accession in 1625, the duke maintained his ascendancy at court. But after the ill-fated expedition against Cadiz, he became odious to the nation, was impeached by the Commons, and only saved by the king dissolving parliament. His insolent behaviour, shown at this period in making love to the queen of France, next helped to embroil us with that country. In 1627 he appeared with an armament before Rochelle, then in possession of the Huguenots, and in revolt against the French crown. But they refused him admission within the harbour; and when his troops made an ill-conducted descent on the neighbouring Isle of Rhé, they were defeated, and Buckingham returned in disgrace to England. He soon after undertook a second expedition to Rochelle, and had gone down to Portsmouth for embarkation, when on 23d August 1628 he was assassinated by a discontented subaltern, John Felton. See the Life of him by Philip Gibbs (1908).

Buckingham, GEORGE VILLIERS, second DUKE OF, was born at Wallingford House (on the site of the Admiralty), 30th January 1627, and, after his father's assassination, was brought up with Charles I.'s children. On the outbreak of the Civil War, he hurried from Cambridge to the royalist camp, and lost, recovered, and once more lost his estates—almost his life, too, during Lord Holland's unfortunate rising in Surrey (1648), when his younger brother did meet a hero's death. He attended Charles II. to Scotland, and after the battle of Worcester and an escape more marvellous even than his master's, went again into exile. Returning secretly to England, he married, in 1657, the daughter of Lord Fairfax, to whom his forfeited estates had been assigned. The Restoration gave them back to Buckingham, and brought Buckingham to court, where for twenty-five years he was the wildest and wickedest roué of them all. In 1671 he killed in a duel the Earl of Shrewsbury, whose countess, his paramour, looked on, disguised as a page. When sated with pleasure, he would turn for a change to ambition, and four times his mad freaks lodged him in the Tower. He was mainly instrumental in Clarendon's downfall; was a member of the infamous 'Cabal' (q.v.); and on its break up in 1673 passed over, like Shaftesbury, to the popular side. But crippled with debt, he retired, after Charles's death in 1685, to his manor of Helmsley, in Yorkshire, and amused himself with the chase. He died on 16th April 1687 at Kirby-Moorside, miserably, if not, indeed, 'in the worst inn's worst room.' Buckingham is remembered as the author, or part-author, of several comedies, the wittiest of which, *The Rehearsal* (1671; ed. Summers, 1914), was a travesty of Dryden's tragedies; but he is better remembered as the 'Zimri' of Dryden's *Abalom and Achitophel*. See Life by Lady Burghclere (1903).

Buckingham, JAMES SILK (1786-1855), a farmer's son, was born near Falmouth, went to sea before he was ten, and after years of unsettled life, in 1818 established a journal at Calcutta, the boldness of whose strictures on the Indian government led to his expulsion from Bengal. In London he established the *Oriental Herald* (1824), and the *Athenæum* (1828), now the leading weekly literary journal. Subsequently he travelled through the United States, and from 1832 to 1837

was member for Sheffield. Besides eighteen books of travel, &c., he had published an Autobiography, when he died 30th June 1855. His youngest son, Leicester (1827-65), was a skilful dramatic adapter.

Buckingham Palace, which in 1837 became the ordinary town residence of Queen Victoria, stands on a site devoted by James I. to the growth of mulberries for the promotion of silkworm-rearing. Under Charles I. Lord Goring became keeper of the mulberry garden, and built Goring House there; later the garden became a place of public entertainment, and by Charles II. was granted to Lord Arlington, who rebuilt Goring House. John Sheffield (q.v.), Duke of Buckingham, bought Arlington House, pulled it down, and in 1698 built Buckingham House in place of it. George III. bought this in 1761 and sometimes lived there. George IV. had it remodelled by Nash in 1825, but it was unoccupied till 1837. See *Royal Palaces of England*, edited by Rait (1911).

Buckinghamshire, or BUCKS, a south-midland county of England, adjoining Bedfordshire, Herts, Middlesex, Surrey, Berks, Oxfordshire, and Northamptonshire, has a maximum length of 57 miles, a varying breadth of $8\frac{1}{2}$ and 27 miles, and an area of 749 sq. m., or 479,366 acres. It is finely diversified with hill and dale, wood and water. To the south is a broad chalk-band, including the Chiltern Hills (q.v.). Sloping north from these hills, and crossed by narrower bands of Greensand and Oolite, is the very fertile vale of Aylesbury, watered by the Thame. The climate is mild and healthy; the soil is mostly good, chalk and clay predominating. Buckinghamshire is eminently an agricultural county, 87 per cent. of the entire area being in cultivation. The farms are generally small, averaging 70 acres. Wheat is the principal crop. The chief dairy product is butter, which finds a ready sale, chiefly in London. In the vale of Aylesbury, fattening of cattle is extensively carried on; the sheep are noted for their fine and heavy fleeces; and large numbers of ducks are reared for metropolitan consumption. Nearly 40 sq. m. are under woods and plantations, beech and oak being the chief timber-trees. The chief manufactures are paper, straw-plait, and thread-lace. The county returns three members to parliament; Aylesbury, Buckingham, Marlow, and Wycombe having ceased in 1885 to be parliamentary boroughs. Buckinghamshire contains some Roman and British remains, as traces of Watling, Icknield, and Ake-man Streets or Ways; remains of the religious houses of Missenden, Notley, Burnham, Medmenham, and Ivinghoe; and vestiges of Lavendon and Whitchurch Castles. There are many examples of Early English and Decorated architecture; and the church of Chetwode (13th century), near Buckingham, contains some fine examples of ancient glass-staining. Many events of historical interest occurred in this county. It was the scene of contest in the civil wars of Stephen and John. At Chalfont St Giles, Milton finished his *Paradise Lost*, and at Horton he wrote *L'Allegro*. At Hampden lived the great patriot of that name; Atterbury was born at Milton; Stoke Poges Churchyard suggested Gray's *Elegy*, and is the place of his burial; at Olney, Cowper lived. Beaconsfield Manor was the seat of Waller; Gregories, near Beaconsfield, of Edmund Burke; Bradenham, of the elder D'Israeli; and Hughenden, of the Earl of Beaconsfield. Scott, the biblical commentator, was rector of Aston Sandford; Herschel's great telescope was erected at Slough, where he made most of his important discoveries; and at Stowe is a magnificent mansion—one of the finest in England, alike for extent, architecture, and beauty of site. Pop. (1801) 108,132; (1881) 176,323; (1911) 219,551; (1921)

236,209. See histories by Lipscomb (1847), Sheahan (1862), and the 'Victoria History' (1905-10).

Buckinghamshire. See BUCKINGHAM, SHEFFIELD (JOHN).

Buckland, WILLIAM, D.D., geologist, was born at Tiverton, Devonshire, in 1784. From Winchester he passed in 1801 to Corpus Christi College, Oxford, of which he became a Fellow (1808); and in 1813 he was appointed Oxford reader in Mineralogy. The same year he was elected a Fellow of the Geological Society, and he was twice its president. In 1818 he became reader in Geology at Oxford, and was elected Fellow of the Royal Society. In 1822 he received the Copley medal for his account of the Kirkdale Cave (q.v.), which in 1823 he supplemented with *Reliquiæ Diluvianæ, or Observations on Organic Remains, attesting the Action of a Universal Deluge*, a theory he afterwards saw cause to modify. In 1825 he was appointed a canon of Christ Church, Oxford; in 1832 he was president of the British Association at Oxford; and in 1836 he published his Bridgewater Treatise, *Geology and Mineralogy considered with Reference to Natural Theology*. In 1845 he was made Dean of Westminster; but under his great and continuous labours to benefit others, his mental faculties gave way seven years before his death, which took place August 14, 1856.—His son, FRANCIS TREVELYAN BUCKLAND, was born 17th December 1826, at Christ Church College, Oxford. He was educated at Winchester and Christ Church, and after for five years devoting himself to the study of medicine at St George's Hospital, London, was assistant-surgeon to the 2d Life Guards (1854-63). From his boyhood he manifested an enthusiastic delight in natural history, especially when it could be applied practically to the cultivation of useful quadrupeds, birds, or fish, in which study he was encouraged and guided by his father. He contributed largely to the *Times*, *Field*, *Queen*, and *Land and Water*, which last he started in 1866. He was also author of *Curiosities of Natural History* (4 vols. 1857-72), *Fish-hatching* (1863), *Logbook of a Fisherman and Zoologist* (1876), *Natural History of British Fishes* (1881), and *Notes and Jottings from Animal Life* (1882). He was an acute observer, and his writings on natural history exhibit the results of fresh and original observations in a most interesting manner. He took a great interest in fish-culture, and at his own cost established under the Science and Art Department, South Kensington, a 'Museum of Economic Fish-culture.' In 1867 he was appointed inspector of salmon-fisheries for England and Wales; in 1870 special commissioner on the salmon-fisheries of Scotland; and in 1877 on the Scottish herring-fisheries. He died December 19, 1880. He was not a Darwinian. See his *Life* by G. C. Bompas (1885).

Bucklandia, a magnificent and beautiful evergreen tree of the order Hamamelidæ (see WITCH-HAZEL), a native of the Himalayas, and growing in the island of Sumatra. The timber is not valuable.

Buckle, HENRY THOMAS, was born at Lee, in Kent, 24th November 1821, the son of a London merchant, a Tory and staunch churchman. A sickly child, he was for a very short time at an academy in Kentish-Town; no other school and no university claims credit for his education, which yet was liberal in the highest degree. At the age of eighteen he found himself master of £1500 a year, and by 1850 he knew eighteen foreign languages, and had amassed a library of 22,000 volumes, chosen mostly to help him in a *magnum opus*, which gradually took shape as *The History*

of *Civilisation in England*. The first volume appeared in 1857, the second in 1861; but his health had been meantime shattered by the loss of an idolised mother; and on 29th May 1862, after six months' wandering in Egypt and Palestine, he died of typhoid fever at Damascus. For more than twenty years he had been reckoned one of the first chess-players in the world.

Buckle's plan involved, before tracing the particular history of English civilisation, a general consideration of the progress of those countries, England, France, Germany, Scotland, Spain, and America, in which the elements of modern civilisation are originally found. The two volumes published are occupied with this preliminary examination, which they do not even complete. His objects, however, are clear. They are (1) to discover what is the essential spirit of a nation's history apart from particular men and events, and (2) to trace out the causes of the progress which has been made in England and France. Under the first head he endeavours to show that the spirit or character of a people is determined by material environments, such as soil, climate, food, aspects of nature, and the like; under the second head occurs the theory—whose vigorous application startled and offended many readers—that the progress of society depends upon scepticism; that the retarding force is credulity; and that the excessive 'protection' exercised by governments, the nobility, the church, &c. over the 'people,' has dwarfed and held back the spirit of freedom and civilisation. These and other positions are defended by Buckle with great ingenuity and lucidity of argument and expression, and have been admitted, even by his opponents, to contain much truth. He is accused—not unjustly—of being often one-sided, and of drawing sweeping deductions from an imperfect survey of facts.

See *Miscellaneous and Posthumous Works*, ed. by Miss Taylor (1872; new ed. by Grant Allen, 1885); the *Life* by A. H. Huth (2 vols. 1880); and J. M. Robertson, *Buckle and his Critics* (1895).

Buckles, metal instruments, consisting of a rim and tongue, used for fastening straps or bands in dress, harness, &c. These are made on a very large scale in the neighbourhood of Birmingham. Both brass and iron are used for them, the chief kinds being called tongue, roller, brace, and gear buckles. The use of buckles, instead of shoe-strings, was introduced into England during the reign of Charles II. They soon became very fashionable, attained an enormous size (the largest being called Artois buckles, after the Comte d'Artois, brother of the king of France), and were usually made of silver, set with diamonds and other precious stones. In the latter half of the 18th century the manufacture of buckles was carried on most extensively in Birmingham, there being at one time not less than 4000 people directly employed in that town and its vicinity, who turned out 2,500,000 pairs of buckles annually, the prices ranging from one shilling to five guineas, and even ten guineas a pair. When the trade was at its height, however, fashion changed, and in 1791 we find buckle-makers petitioning the Prince of Wales for sympathy, on the ground that owing to the introduction of shoe-strings and slippers, 20,000 persons were in terrible distress. The prince promised to assist them as far as he could by wearing buckles himself, and enjoining his household to do the same; but fashion was too strong even for him, and before the close of the century a great staple trade of Birmingham had become extinct, though shoe-buckles are still by no means unknown.

Buckram. This name is now applied to a coarse open-woven fabric of cotton or linen made

very stiff with size. It is used for the framework of ladies' bonnets, for the inside of belts and collars of dresses, and for bookbinding. But the buckram of olden times was an entirely different kind of stuff, a fine linen or cotton cloth. (The name *bucaranus*, *boquerannus*, &c. in medieval Latin, *boquerant* in Old French, &c., may be from the Arabic.) Rock's Catalogue of Textiles in the South Kensington Museum says: 'All along the middle ages buckram was much esteemed for being costly and very fine, and consequently fit for use in church vestments, and for secular personal wear. Grandison, consecrated Bishop of Exeter in 1327, gave to his cathedral banners of white and red buckram; and three of the rich veils for covering the lectern in that church were lined with blue bokeram. As late as the beginning of the 16th century this stuff was held good enough for lining to a black velvet gown for a queen, Elizabeth of York;' but to most minds it is now familiar through Falstaff's antagonists, the 'rogues in buckram suits.'

Buckskin is a soft leather made of deerskin or sheepskin; also a strong, twilled woollen cloth, cropped of nap and carefully finished. 'Buckskin breeches' are usually of this cloth, not of the leather. See **BUFF LEATHER**.

Buckstone, JOHN BALDWIN, comedian and dramatic writer, was born at Hoxton, London, in 1802, and, having in 1822 exchanged an attorney's office for the provincial stage, appeared next year at the Surrey Theatre. His success was so unequivocal that in 1827 he was engaged by the Adelphi Theatre, where he continued till 1833 as leading low comedian. Except for a visit to the United States in 1840, and short engagements at Drury Lane and the Lyceum, he thenceforward played chiefly at the Haymarket, of which he was lessee from 1853 till 1878. He died 31st October 1879. Buckstone's acting was not more noted for its comicality and humour, which never degenerated into vulgarity, than for its distinct appreciation of the peculiar traits in each individual character he assumed. He was also a prolific dramatic author, and of the 150 pieces he wrote for the stage, several have been highly popular.

Buckthorn (*Rhamnus*), a genus of Rhamnaceæ (q.v.), including sixty species, all shrubs or trees, widely distributed through temperate and tropical regions, but absent from Australia.—The Common Buckthorn (*R. catharticus*) is characterised by its spinous and cross-like branchlets, serrate leaves, and yellow-green dioecious flowers. The berries, which are about the size of peas, globular, bluish-black, nauseous, and violently purgative, were formerly much used in medicine, but now more rarely, and only in the form of a sirup prepared from their juice. They supply the Sap Green (q.v.) or Bladder Green of painters. The bark affords a beautiful yellow dye. The buckthorn is sometimes planted for hedges, but is of too straggling a habit.—The Alder Buckthorn, or Breaking Buckthorn (*R. frangula*), also (wrongly) called Black Alder, or Berry-bearing Alder, is spineless, with oval entire leaves, and small, whitish, axillary flowers. The berries are small and black, and also violently purgative, yet are freely eaten by birds. The charcoal of the wood is light, and is used by gunpowder-makers and called dogwood. The bark, leaves, and berries are used for dyeing. The flowers are peculiarly grateful to bees.—Dyer's Buckthorn (*R. infectorius*) is a low shrub, abundant in the south of Europe, whose unripe fruit yields a brilliant yellow dye. The French Berries, Avignon Berries, or Yellow Berries of dyers, are the fruit of this and other species.—Of North American buckthorns there are, besides the Com-

mon one, six or more peculiar species. The most important is the *R. purshiana* of the north-west Pacific slope (especially south-west Oregon), the



Alder Buckthorn (*Rhamnus frangula*):
a, a flower.

cathartic bark of which is used in medicine under the name of Cascara Sagrada.—The Sea Buckthorn (q.v.; *Hippophaë rhamnoides*) is a shrub of a different genus and order (Elaeagnaceæ). It is occasionally planted as an ornamental shrub.

Bucku, or **BUCHU**, a Hottentot name common to several small aromatic evergreen rutaceous shrubs of the genus *Barosma* (*Diosma*), natives of the Cape of Good Hope, the leaves of which (*folia Buchu*) have enjoyed considerable medical repute, especially as a diuretic.

Buckwheat (*Fagopyrum esculentum*, or *Polygonum Fagopyrum*) is a native of the basin of the Volga, the shores of the Caspian Sea, and many parts of Central Asia. A recent German authority affirms that there is no authentic mention of it



Buckwheat (*Fagopyrum esculentum*):
a, a flower; b, a seed; c, root.

until 1436 at Mecklenburg, whence it spread over Europe in the following century. It is also said to have been introduced by the Moors into Spain, and

thence to have extended over Europe, or, again, to have been brought to Europe by the Crusaders. The French name *Sarrasin* seems to support these latter traditions. It is cultivated on account of the farinaceous albumen of its seeds, which are used, as grain, for food of man and cattle. It is upright, branched, 1 to 3 feet in height; the leaves are between heart-shaped and arrow-shaped, the flowers pale red, the seed (nut) black and triangular, its angles entire. The resemblance of this seed in form to the beech-nut is supposed to be the reason of the German name *Buchweizen* (lit. 'beech-wheat'), from which the English name is derived. Buckwheat is a very common crop in some parts of Europe and of the United States of North America, but is seldom sown in Britain, except as food for pheasants, as it requires continued dry weather in autumn for profitable harvesting. In north-east Germany, and also in Brittany, buckwheat is valued as a crop, particularly for sandy heaths, moorlands, and other poor soils. It yields abundantly, and requires little manure or attention. Forty bushels or more per acre may be expected, weighing 46 or 48 lb. per bushel; and notwithstanding the resemblance of the seed to grain in its qualities and uses, wheat or any other cereal crop generally succeeds well after buckwheat. The seed is most frequently used in the shape of groats, or made into pottage; in the United States, thin cakes of the flour are a standard food. It is very nutritious, containing about 10 per cent. of gluten and 52 per cent. of starch, besides about 6 per cent. of gum and sugar. It is said to be as good as barley for fattening cattle, and better for horses than oats. But as the seed is covered with a very hard rind or thin shell, it must always be shelled before being given to cattle. Poultry are very fond of it. Beer is sometimes brewed from it, and it yields a spirituous liquor of good quality; indeed, it is frequently used in gin-distilleries. As green fodder, the herbage of the plant is said to be more nutritious than clover; but it is said to act as a narcotic on sheep. Bees delight in its flowers, and in some parts of the United States it is sown on this account. In America the seed is usually sown broadcast over the land, which has been ploughed in autumn or early spring, and well scarified or harrowed. About a bushel and a half of seed per acre is required when sown broadcast, but a bushel is sufficient if drilled with a machine. In the latter case it should not be sown in narrower drills than one foot apart, but two feet is recommended as being better for the succeeding crop, as the wider intervals can be properly cultivated. It should not be sown in England before the middle of May, as the least frost is injurious. When the lower seeds are ripe it should be mown, as they are easily shed out if allowed to stand too long.—Tartarian Buckwheat (*F. tataricum*) is distinguished by the toothed edges of the seeds and its more vigorous growth. It is hardy, and adapted for cold situations, but yields inferior meal, and is reckoned a mere weed in Germany. In Canada, on the other hand, it is much grown; but its use, as well as that of common buckwheat, is thought by many to induce skin disease. *F. emarginatum* is cultivated in China.—Dyer's Buckwheat is *Polygonum tinctorium*. See POLYGONÆÆ.

Bucolic, a term derived from the Greek, 'belonging to herdsmen,' nearly equal to *Pastoral*, from Latin. It is specially used of a kind of Pastoral Poetry (q.v.). The great bucolic poets were Theocritus, Bion, Moschus; and Virgil's Eclogues are sometimes called *Bucolica*.

Buczacz, a town of Eastern Galicia, on the Stripa, an affluent of the Dniester, 47 miles ENE. of Stanislau by rail. A treaty of peace between the

Poles and the Turks was signed here in 1672. Pop. 13,000, mostly Jews.

Bud. The bud is the rudiment of an axis with its appendages. Starting with the seed, we may trace the continued upgrowth of the primeval bud or plumule in germination. Again, by examination

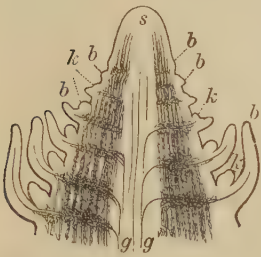


Fig. 1.—Longitudinal section through the apical region of an upright shoot of *Hippuris vulgaris*:

s, growing point of the stem; *b*, *b*, *b*, the whorled leaves; *k*, *k*, the buds in their axils, which all develop into flowers; *g*, *g*, the first vessels (the dark parts of the tissue indicate the inner cortex with its intercellular spaces). (After Sachs.)

of the growing point at any age, we may observe the progressive development of new appendages with crowded nodes but lengthening internodes of stem from the undifferentiated embryonic tissue (see MERISTEM) of its apex (fig. 1). In monocotyledons especially, an axis may have only a single apical bud; and of this mode of growth the palms furnish the most salient example; in the majority of dicotyledons, on the other hand, every vegetative leaf may be regarded as having, if not an actual, at anyrate a potential or latent bud

in its axil, which may, at least under exceptional circumstances, vegetate as a new axis or Branch (q.v.), or become developed for reproduction as a flower.

In some hardy shrubs and trees the buds are quite inconspicuous in winter, being so minute as to be hidden under an apical coating of bark (e.g. *Taxodium*, *Philadelphus*); generally, however, the buds are well formed before autumn, and are thus fully exposed to the severity of winter. In a few cases (e.g. species of *Viburnum*, although not the common Guelder Rose) the outer leaves still retain sufficient vitality to expand as the first foliage of spring. In the vast majority of plants, however, the leaves are not so hardy, and the outer ones have thus to be sacrificed for the protection of the rest. Since in any upward-growing axis, the lower and earlier formed appendages tend to grow beyond the embryonic apex with its short internodes, and thus cover it up more or less entirely with its developing higher and younger appendages, the normal form of every bud is thus, as it were, a kind of incipient cabbage; and this overlapping



Fig. 2.
Bud Scales of
Rhododendron.

mode of growth comes to be of the greatest protective usefulness. For the changes of day and night, of weather, and most of all, of the seasons, render the process of growth not continuous but rhythmic; and a growing point has thus latent as well as active periods. During the former, however, the outer appendages are exposed to the climate, and usually present adaptive modifications of great variety and interest, which are known as the *bud-scales*. These are often waterproofed with an exudation of resinous varnish, or warmly lined with an epidermic down.

While, in what may be safely taken as the simplest cases, the bud-scales are modifications of entire leaves (e.g. lilac or rhododendron, fig. 2), in many plants the bud-scale is reduced to the petiole only. This is beautifully shown where a series of gradations survives, as is

very often the case in the horse-chestnut; in opening buds of which it is often possible to trace every step of the reduction of the complete foliage-leaf to the petiolar bud-scale (fig. 3, *b*). Finally, bud-scales may be derived from stipules, as in the magnolia or



Fig. 3.

a, opening ends of beech, showing stipular bud-scales; *b*, petiolar bud-scales of horse-chestnut, showing transitions to the two true leaves above.

the beech (fig. 3, *a*). In all these cases alike, the scales are thrown off by the opening buds in spring, and often carpet the ground like a foreshadowing of autumn.

Buds, as has been said, when other than terminal, are usually axillary to the leaves, and their origin may be traced almost as far back as that of the leaves themselves; this may be conveniently seen in a section of the growing point of the mare's-tail (*Hippuris*, fig. 1). Occasionally, too, the bud forms quite under the base of the leaf-stalk, and is concealed by it until this falls off in autumn (*Platanus*). There is usually only one bud in each axil, yet in many plants 'accessory buds' occur. These may be collateral in position, the middle one being largest, as in some hawthorns, willows, and maples; in other cases, however, they form a vertical series, of which either the lowest, and alone strictly axillary bud, may be largest and strongest, as in some honeysuckles, or the uppermost, as in the *Aristolochia* or the butternut, where, indeed, the main branches are thus extra-axillary.

In many cases buds are also of *adventitious* origin—i.e. may arise quite independently of leaves, from any part of the stem—as is well seen on the trunk of the elm-tree, in pollarded willows, in fact in any tree deprived of its branches, or often even after being felled. This is intelligible when we reflect that at all such points there lies the *Cambium* (q.v.) or embryonic layer of cells; in the rarer case of origin of adventitious buds from roots, as in the bramble, we have similarly a *pericambium* (see ROOT): the most curious and exceptional (yet in a deeper view of cellular physiology the most natural) mode of origin is when the leaf-parenchyma itself retains a sufficiently embryonic character to give rise to new buds without the presence of any specially reproductive cells. This is well seen on the surface of the fronds of certain ferns, and is also experimentally reproduced by gardeners, who often raise young plants from the edges of a *Bryophyllum* leaf (fig. 4), or from the petiole or wounded surface of a leaf of *Begonia*, by simply placing it on sand in a warm and moist atmosphere.



Fig. 4.—*Bryophyllum* Leaf, from the edges of which two new plants have budded.

This passage from ordinary vegetative growth to

that discontinuous growth which we call asexual reproduction, and also that further transition to sexual reproduction (see REPRODUCTION, SEX), is admirably illustrated by the interesting reversion to ordinary bud-growth which these more specialised processes often exhibit in unusually favourable vegetative conditions, or even as a permanent habit. Thus in Ferns (q.v.) we may have the budding of prothallia directly upon the frond in the place of spore-cases, or that of the fern plant directly upon the prothallium in place of archegonia. Again, the reversion of floral to leafy buds occurs more or less completely in many garden-flowers, while in many wild species of Allium the flowers become largely replaced by vegetative buds capable of independent growth. This tendency to bud-independence is also well shown in the bulbils and bulbs of many other allied Liliaceæ; while the multiplication of plants by cuttings of course takes advantage of the same widespread latent possibility of separate bud-life. In the old disputes about the individuality of plants and animals, the bud was in fact often defined as a separate individual, and the tree thus viewed as a mere colony of buds. For the growth of buds, see BRANCH; and for arrangement of leaves in buds, see VERNATION, ÆSTIVATION, FLOWER.

Budding or gemmation is also a frequent mode of growth in animals. See REPRODUCTION.

Buda (Ger. *Ofen*), a town of Hungary on the right bank of the Danube, now united with Pest or Pesth on the left bank as Budapest (q.v.).

Budæus (the Latinised form of *Guillaume Budé*), the greatest French scholar of his age, who was born in Paris in 1467. His works on philology, philosophy, and jurisprudence display extensive learning, the two best known being the *De Asse et Partibus ejus* (1514), which contains a very thorough investigation into ancient coins, and the *Commentarii Linguae Græcæ* (1519), the basis of all subsequent works in this department. His abilities were manifested not only in literature, but in public business. Louis XII. twice sent him to Rome, and Francis I. also employed him in several negotiations. At Budæus's suggestion, Francis founded the Collège de France, and was also persuaded to refrain from prohibiting printing, which the bigoted Sorbonne had advised in 1533. He was royal librarian at the time of his death, 23d August 1540. He was suspected, not without reason, of a leaning towards Lutheranism. His works were collected in 4 vols. (Basel, 1557). See his *Life* by Rebitté (1846), and E. de Budé (1884); and the latter's edition of his *Lettres inédites* (2 vols. 1887).

Bu'dapest, the capital of Hungary, and formerly of the Hungarian moiety of the Dual Monarchy, consists of Buda (Ger. *Ofen*) on the right and Pest or Pesth on the left bank of the Danube, the two cities having formed a single municipality since 1872. The two towns are connected by many bridges, a chain bridge (designed by Clark Brothers of England in 1842-49), 1280 feet long, uniting the busiest quarters; another chain bridge built in 1903, a little lower; and others. Pest is essentially a modern place, the growth principally of the 19th century; it has many fine streets and squares, the magnificent quays beside the Danube being the favourite promenades; the buildings are chiefly noteworthy for their substantial appearance and frequently large size. Amongst them may be enumerated the Jewish synagogue (the handsomest place of worship in the city); the parish church (1500) and the Leopold basilica (1851-68); the national museum (after 1850), containing collections of pictures, ethnography, natural history, numismatics, and

antiquities, and a great library; the academy of sciences (1862), with its library; the university (1635), established first at Tyrnau, then at Buda in 1777, and lastly at Pest in 1783, with excellent scientific laboratories, &c., and an extensive library; the custom-house (1870-74); industrial, commercial, and fine art museums; and the magnificent parliament houses and the palace of justice.

Whilst Pest stands on a plain, Buda straggles over small steep hills, and is backed by vine-clad slopes. It is a much older town, its central features being the castle in the citadel (1749-71), with the chapel of St Sigismund, in which are preserved the crown regalia of Hungary and the hand of St Stephen; the Matthias church (13th century); the palaces of the various ministries; the monumental tomb of Gul Babas (1543-48), a Turkish saint; and the national lunatic asylum (1860-68).

Both towns are exceptionally well provided with baths, which are supplied both by the Danube and by numerous natural springs of mineral waters. Some of these last—Hunyadi János, Rákóczy, &c.—are exported in large quantities in bottles. The artesian well in the public garden of Pest has been already referred to under ARTESIAN WELLS. The water-works of Pest were planned and built by the English engineer Lindley in 1868. Both towns possess an unusual number of philanthropic institutions, such as hospitals, asylums, &c. There is in Pest a polytechnic (in Buda, 1846-72), with faculties of chemistry, architecture, agriculture, and engineering. A great number of learned and scientific societies flourish; and there is a music academy. The people are gay and fond of amusement, especially horse-racing and rowing. There are two beautiful public gardens, one in Pest, the other on Margaret Island in the Danube, just above the town. The squares and streets of both Pest and Buda are adorned with many statues of celebrated Hungarians. These figures show the extraordinarily rapid growth of Budapest; pop. (1813) 36,153; (1833) 63,148; (1857) 116,683; (1881) 370,767; (1891) 491,938; (1900) 716,476; (1910) 880,371; (1921) 1,184,616. Of the total in 1910 (including the garrison of 17,000), 85.9 per cent. were Magyars, 9.0 Germans, and 2.3 Slovaks; 59.7 per cent. were Roman Catholics, 23.1 Jews, and 14.8 Protestants. Budapest is the first manufacturing town of Hungary. The making of machinery and agricultural implements, wagons, and ships; the manufacture of spirits, tobacco, beer, gold and silver wares, cutlery, starch, glass, and innumerable other articles; the grinding of corn, washing of wool, and printing, are all prosecuted on a large scale. But the commerce is even more important: immense quantities of corn are brought into the town, and exported farther either as corn or as flour; wool, wine and spirits, oil-seeds and agricultural seeds, hemp, tobacco, plums (from Bosnia and Serbia), honey and wax, bacon, hides, feathers, timber, coal, and manufactured wares are the principal articles of the extensive trade. Vast numbers of swine are fattened and killed in huge yards just outside Pest.

The Romans had a military colony (*Aquincum*) on the site of the modern Buda. In the 13th century there existed here a flourishing German town, Old Buda. This was destroyed by the Mongols in 1241; but it soon recovered from the blow. Buda was regarded as the capital of the country from the middle of the same century down to its capture by the Turks in 1527. From 1541 down to 1686 the Turks held Buda, though it was besieged half-a-dozen times by the Austrians. Pest meanwhile was reduced to a heap of ruins; and it did not begin to recover until the first quarter of the 18th century. A century later it was rapidly out-

stripping its twin-sister Buda, which now lags far behind. Budapest was occupied by the Rumanians in August 1919. French, British, and Americans arrived later.

Budaun, a town of India, 140 miles NW. of Lucknow, giving name to a British district of the Rohilkhand division of the United Provinces. Pop. 38,000.—The district, a level, fertile tract on the Ganges and its tributaries, contains an area of just under 2000 sq. m.; pop. 1,000,000, six-sevenths Hindus.

Budayya, a town in the north of Bahrein. See BAHREIN ISLANDS.

Budd, GEORGE, physician, born in February 1808 at North Tawton, Devonshire, studied at Cambridge, and was a fellow of Caius College. He was professor of medicine in King's College, London (1840-63), and after practising privately retired to Barnstaple in 1867, and died 14th March 1882. He wrote on cholera, scurvy, and diseases of the stomach and liver.

Budd, WILLIAM, physician, younger brother of George Budd (q.v.), was born at North Tawton in September 1811. He studied in London, Edinburgh, and Paris, practised in Bristol, and died at Clevedon, 9th January 1880. Besides an important work on typhus, he wrote on cholera, cattle-plague, and other subjects.

Budde, KARL FERDINAND REINHARD, born at Bensberg, near Cologne, 1850, was professor at Bonn, Zurich, Strassburg, and (from 1900) Marburg, rector of the university 1910. He wrote *Die Biblische Urgeschichte*, a work on Samuel and Judges, commentaries and translations.

Buddens, JOHANN FRANZ, Lutheran theologian and scholar, was born, a pastor's son, at Anklam, Pomerania, 25th June 1667. He studied at Greifswald and Wittenberg, taught Greek and Latin at Coburg, was professor of moral philosophy at Halle (1693), and of theology at Jena (1705). He died at Gotha 29th November 1729. His many writings include *Historia Ecclesiastica Veteris Testamenti* (1709-20), works on moral and dogmatic theology, philosophy, the law of nature and of nations, and an *Allgemeines historisches Lexikon* (1709 et seq.).

Buddha is at once one of the names of the founder of Buddhism (otherwise called Siddharta, Gautama, Sakyamuni), and a general name for any one of a series of teachers of whom he is reckoned one. See BUDDHISM; also BARLAAM and JOSAPHAT.

Buddhaghosa, a notable Buddhist writer, born about A.D. 390 at Buddh Gaya. He went to study at Anuradhapura, and translated the Singhalese commentaries into Pali. Part of his translation has been edited by Rhys Davids and Carpenter (1886). He wrote much else.

Buddh Gaya, BUDH GAYA, or BODH GAYA, a village of Bihar, 6 miles S. of Gaya, one of the holiest places of Buddhism (q.v.), has many temples (ruined and restored) and sculptures. In the courtyard of one temple is a descendant of the Bo-tree (q.v.) under which Siddharta became the Buddha.

Buddhism. The religion known as Buddhism (from the title of 'The Buddha,' meaning 'the awakened,' 'the enlightened,' acquired by its founder) has existed now for perhaps 2400 years, and is, as regards the number of its adherents, the prevailing religion of the world. In India, the land of its birth, it has now little hold, except among the Nepalese and some other northern tribes; but it bears full sway in Ceylon and over the whole Indo-Chinese Peninsula; it divides the adherence of the Chinese with the systems of Confucius and Lao-tse, claiming perhaps a majority of the population; it prevails also in Japan (although

not the established religion); and, north of the Himalayas, it is the religion of Tibet (where it assumes the form of Lamaism), of the Mongolian population of Central Asia and Southern Siberia, and of the Tatar tribes on the Lower Volga. Its adherents are estimated at more than 500 millions—or about a third of the whole human race. Yet, till towards the middle of the 19th century, nothing was known in Europe respecting the nature and origin of this world-religion, beyond the vaguest notices and conjectures. About the year 1828 B. H. Hodgson, British resident at the court of Nepal, where Buddhism prevails, discovered the existence of a large set of writings in the Sanskrit language, forming the national canonical books. These books were afterwards found to be the texts from which the Buddhist scriptures of Tibet, Mongolia, and China must have been translated. The books of the Ceylon Buddhists are in the language called Pali; and though not translations of the Nepalese standards, they are found to agree with them in substance, and to be only another and somewhat later version of the same traditions. Translations from the Ceylon standards are used by the Buddhists of Burma and Siam. Copies of the Sanskrit books of Nepal, having been sent by Hodgson to the Asiatic Societies of London and Paris, engaged the attention of the great orientalist, Eugene Burnouf, who published in 1844 his *Introduction à l'Histoire du Bouddhisme Indien*; and this book may be said to have been the beginning of anything like correct information on the subject among the western nations.

The most diverse opinions had previously prevailed as to the time and place of the origin of Buddhism. Some looked upon it as a relic of what had been the original religion of India, before Brahmanism intruded and drove it out; a relic of a widespread primeval worship, whose ramifications they endeavoured to trace by identifying Buddha with the Odin of the Scandinavians, the Thoth or Hermes of the ancient Egyptians, and other mythological personages. Others held that it could not be older than Christianity, and must have originated in a blundering attempt to copy that religion—so striking are the many points of resemblance that present themselves. Although the materials are still wanting for a circumstantial history of Buddhism, the main outline is no longer doubtful. Oriental scholars now generally concur in fixing the date of its origin some time in the 5th century B.C., and in making it spring up in the north of India. According to the Buddhist books, the founder of the religion was a prince of the name of Siddhartha, son of Suddhodana, king of Kapilavastu, which is placed somewhere on the confines of Oudh and Nepal. He is often called Sakya, which was the name of the family, or Sakya-muni—i.e. the Sakya sage—and also Gautama, the name of the great 'solar' race of which the family was a branch. To Gautama is frequently prefixed *Sramana*, meaning *ascetic*. Of the names, or rather titles, given to Siddhartha in his state of perfection, the most important is the *Buddha*, which is from the root *budh*, 'to awake,' 'to know,' and which in this connection means 'he who is liberated from existence by the knowledge of the truth'; it is indicative of the leading doctrine of his system. Others are—'The Blessed' (*Bhagavat*); 'the King of Righteousness' (*Dharma-raja*); 'the Conqueror' (*Jina*), &c. The history of Buddha is overlaid with a mass of extravagant and incredible legend; and H. H. Wilson thought it doubtful whether the Buddha was an actual historical personage, and not rather an allegorical figure. Sénart and Kern sought to show that the Buddha of the legend is the sun-god, and that the

details of his life have been taken from solar mythology, and that the whole has been modified under the influence of the monastic ideas amid which the legend grew up, though they allowed that Buddhism had a human founder. Few orientalist are prepared to follow them.

The Founder.—Assuming that the Buddha was a real person, and that there is a basis of fact under the mass of extravagant fable with which he is surrounded, the history of Buddhism may be thus briefly outlined: The Prince Siddhartha gives early indications of a contemplative, ascetic disposition; and his father, fearing lest he should desert his high station as Kshatriya (see CASTE and INDIA) and ruler, and take to a religious life, has him early married to a charming princess, and surrounded with all the splendour and dissipation of a luxurious court. Twelve years spent in this environment only deepen the conviction that all that life can offer is vanity and vexation of spirit. He is constantly brooding over the thought that old age, withered and joyless, is fast approaching; that loathsome or racking sickness may at any moment seize him; that death will at all events soon cut off all present sources of enjoyment, and usher in a new cycle of unknown trials and sufferings. These images hang like Damocles' sword over every proposed feast of pleasure, and make enjoyment impossible. He therefore resolves to try whether a life of austerity will not lead to peace; and, although his father seeks to detain him by setting guards on every outlet of the palace, he escapes, and begins the life of a religious mendicant, being now about thirty years old. To mark his breaking off all secular ties, he cuts off the long locks that were a sign of his high caste; and as the shortened hair turned upwards, he is always represented in pictures with curly hair. He commences by studying all that the Brahmins can teach him, but finds their doctrine unsatisfactory. Six years of rigorous asceticism are equally vain; and resolving to return to a more genial life, he is deserted by his five disciples, and then undergoes a fierce temptation from the demon of wickedness. But no discouragement or opposition can divert Sakya-muni from the search after deliverance. He will conquer the secret by sheer force of thinking. He sits for weeks plunged in abstraction, revolving the causes of things. If we were not born, he reflects, we should not be subject to old age, misery, and death; therefore the cause of these evils is birth. But whence comes birth or continued existence? Through a long concatenation of intermediate causes, he arrives at the conclusion that ignorance is the ultimate cause of existence; and therefore, with the removal of ignorance, existence and all its anxieties and miseries would be cut off at their source. Passing through successive stages of contemplation, he realises this in his own person, and attains the perfect wisdom of the Buddha. The scene of this final triumph received the name of Bodhimanda ('the seat of intelligence'), and the tree under which he sat was called Bodhidruma ('the tree of intelligence'), whence Bo-tree. The Buddhists believe the spot to be the centre of the earth. Twelve hundred years after the Buddha's death, Hwen-Thsang, the Chinese Pilgrim, found the Bodhidruma—or a tree that passed for it—still standing. Although the religion of Buddha is extinct in the neighbourhood, there are, 6 miles from Gaya town, in Bihar, extensive ruins and a 14th-century temple (partially restored since 1878), which are believed to mark the place. Within the temple courtyard is a pipal-tree, which claims to be the lineal descendant of the original Bo-tree. See BO-TREE.

Having arrived at the knowledge of the causes of misery, and of the means by which these causes

are to be counteracted, the Buddha was now ready to lead others on the road of salvation. It was at Benares that he first preached, or, in the consecrated phrase, 'turned the wheel of the law.' (This expression comes from one of the titles of the Buddha, *chakravartin*, 'a monarch,' being taken in its etymological sense—i.e. 'the turner of a wheel;') hence, too, have arisen, probably, those praying-wheels seen standing before Buddhist monasteries in Tibet and elsewhere. The doctrines of Buddha are inscribed on the wheel, which is then set in motion by a windlass, or even by horse-power. The individual monks have portable ones, with which they perform their devotions.) But the most important of his early converts was Bimbisara, the sovereign of Magadha (Bihar), whose dynasty continued for many centuries to patronise the new faith. During the forty years that the Buddha continued to preach his strange gospel, he appears to have traversed great part of Northern India, combating the Brahmins, and everywhere making numerous converts. He died at Kusinagara (in Oudh), at the age of eighty; and his body being burned, the relics were distributed among nine communities of believers, and tumuli erected to preserve them (see TOPE). One of these was discovered in 1898 in Basti district; others in the 20th century near Peshawar, at Mirpur Khas (40 miles E. of Haidarabad), and at the ruins of Taxila (near Rawalpindi)—all apparently in their original shrines and settings.

History of the Order.—The Buddha had written nothing himself; but his chief followers assembled in council immediately after his death to settle the rules and doctrines of the order. About a hundred years later, a second council was held to vindicate these against innovators who seceded and held a rival council. In the reign of Asoka, in 244 B.C., there was a third, in which the canon seems to have been fixed more accurately. Some 150 years later it was reduced to writing, apparently in its present form. These canonical writings are divided into three classes, forming the Tripitaka, or 'triple basket.' The first class consists of the *Sutras*, or discourses of the Buddha for the laity; the second contains the *Vinaya*, or discipline for the order; and the third the *Abhidharma*, or metaphysics. The first is evidently the fundamental text out of which all the subsequent writings have been elaborated. The Buddhist religion early manifested a zealous missionary spirit; and princes and even princesses became devoted propagandists. A prince of the royal House of Magadha, Mahindo, carried the faith to Ceylon immediately after the last council, whence it spread to Burma, 450 A.D., and Siam, 638 A.D. The Chinese annals speak of a Buddhist missionary as early as 217 B.C.; and the doctrine made such progress that in 65 A.D. it was acknowledged by the Chinese emperor as a third state religion. The Chinese Buddhists have always looked on India as their 'holy land;' and, beginning with the 4th century of our era, a stream of Buddhist pilgrims continued to flow from China to India during six centuries. Several of these pilgrims have left accounts of their travels, which throw a light on the course of Buddhism in India, and on the internal state of the country in general, that is looked for in vain in the literature of India itself (see HWEN-THSANG). As to the spread of Buddhism north of the Himalayan Mountains, we have the historical fact that a Chinese general, having about the year 120 B.C. defeated the barbarous tribes to the north of the Desert of Gobi, brought back as a trophy a golden statue of the Buddha.

A prominent name in the history of Buddhism is that of Asoka (q.v.), king of Magadha, in the 3d century B.C., whose sway seems to have extended over the whole peninsula of Hindustan, and even

over Ceylon. This prince was to Buddhism what Constantine was to Christianity. He was at first a persecutor of the faith, but being converted—by a miracle, according to the legend—he became its zealous propagator. Not, however, as princes usually promote their creed; for it is a distinguishing characteristic of Buddhism that it has never employed force, hardly even to resist aggression. Asoka showed his zeal by building and endowing viharas or monasteries, and raising topes and other monuments over the relics of Buddha and in spots remarkable as the scenes of his labours. Hwen-Thsang, in the 7th century of our era, found topes attributed to Asoka from the foot of the Hindu Kush to the extremity of the peninsula. The pillar erected by him on the site of the garden at Kapilavastu, about 100 miles N. of Benares, where Buddha was born, was discovered. There exist, also, in different parts of India, edicts inscribed on rocks and pillars, inculcating the doctrines of Buddha. The edicts are in the name of King Piyadasi; but orientalists are almost unanimous in holding Piyadasi and Asoka to be one and the same. A remarkable spirit of charity and toleration runs through these royal sermons. The 'king beloved of the gods' desires to see the ascetics of all creeds living in all places, for they all teach the essential rules of conduct. 'A man ought to honour his own faith only; but he should never abuse the faith of others. . . . There are even circumstances where the religion of others ought to be honoured, and in acting thus, a man fortifies his own faith, and assists the faith of others.' The next name of importance after Asoka is that of Kanishka (10 A.D.), king of North-western India, under whose direction a council was held for a fresh revision of the canon. It seems to have been shortly after this that the Buddhists broke up into two schools—viz. the 'Lesser Vehicle,' or conservative party, formed by the southern Buddhists, and the 'Greater Vehicle,' or progressive party, embracing the Buddhists of the north.

For the glimpses we get of the state of Buddhism in India, we are indebted chiefly to the accounts of Chinese pilgrims. Fa-hian, at the end of the 4th century, found some appearances of decline in the east of Hindustan, its birthplace, but it was still strong in the Punjab and the north. In Ceylon, it was flourishing in full vigour, the ascetics or monks numbering from 50,000 to 60,000. In the 7th century—i.e. 1200 years after the death of the Buddha—Hwen-Thsang represents it as widely dominant and flourishing, and patronised by the powerful Siladitya, king of Kanoj, who held a council at which the doctrines of the Little Vehicle were condemned. Its history was doubtless more or less checkered. The Brahmins, though little less tolerant than the followers of Buddha, seem to have been in some cases roused into active opposition; and some princes employed persecution to put down the new faith.

It was probably during the first four or five centuries of our era, and as a result of persecution, that Buddhists, driven from the great cities, retired among the hills of the west, and there constructed those cave-temples which, for their number, vastness, and elaborate structure, continue to excite the wonder of all who see them. There are reckoned to be not fewer than 900 Buddhist excavations still extant in India, nearly all within the presidency of Bombay. The destruction of Buddhism in India seems to have been brought about largely by internal corruption, but most of all by the Mohammedan invasion. For several centuries we have notices of it as existing in Kashmir, Bengal, and the Deccan, till it at last disappears in Orissa in the middle of the 16th century.

What, then, is the nature of this faith, which has

been for so long, and is still, the sole light of so many millions of human beings? In answering this question, we must confine ourselves here to a brief outline of the intellectual theory on which the system is based, and of the general character of its morality and ritual observances, as they were conceived by the founder and his more immediate followers; referring for the various forms which the external observances have assumed to the several countries where it is believed and practised. See BURMA, CEYLON, CHINA, JAPAN, LAMAISM.

The Doctrine.—Buddhism is based on the same views of human existence, and the same philosophy of things in general, that prevailed among the Brahmins, although it was a reaction against their hierarchy. It accepts without questioning the doctrine of the transmigration of souls, which lies at the root of so much that is strange in the Indian character. For a fuller account of this important doctrine, the reader is referred to TRANSMIGRATION; while the peculiar cosmogony or system of the universe with which it is associated, and which is substantially the same among Hindus and Buddhists, is described under INDIA (*Religion*). It is sufficient here to say that, according to Buddhist belief, when a man dies he is immediately born again, or appears in a new shape; and that shape may, according to his merit or demerit, be any of the innumerable orders of being composing the Buddhist universe—from a clod to a divinity. If his demerit would not be sufficiently punished by a degraded earthly existence—in the form, for instance, of a woman or a slave, of a persecuted or a disgusting animal, of a plant, or even of a piece of inorganic matter—he will be born in some one of the 136 Buddhist hells. These places of punishment have a regular gradation in the intensity of the suffering and in the length of time the sufferers live, the least term of life being ten millions of years, the longer terms being almost beyond the powers of even Indian notation to express. A meritorious life, on the other hand, secures the next birth, either in an exalted and happy position on earth, or as a blessed spirit, or even divinity, in one of the many heavens; in which the least duration of life is about ten billions of years. But however long the life, whether of misery or of bliss, it ends when the *karma* is exhausted, and the individual must be born again, and may again be either happy or miserable—either a god, or it may be, the vilest inanimate object. One legend makes Bhagavat, in order to impress upon the monks of a monastery the importance of their duties, point to a besom, and, by his supernatural insight, reveal to them that it had once been a novice who had been negligent in sweeping the hall of assembly; the walls and pillars, again, he told them, had once existed as monks, who soiled the walls of the hall by spitting upon them. The Buddha himself, before his last birth as Sakya-muni, had gone through every conceivable form of existence on the earth, in the air, and in the water, in hell and in heaven, and had filled every condition in human life. When he attained the perfect knowledge of the Buddha, he was able to recall all these existences; and that part of the Buddhist legendary literature called the Jatakas narrates his exploits when he lived as an elephant, as a bird, as a stag, and so forth.

The Buddhist conception is peculiar of the way in which the quality of actions—which is expressed by the word *karma* ('doing'), including both merit and demerit—determines the future condition of all sentient beings. They do not conceive any god or gods as being pleased or displeased by the actions, and as assigning the actors their future condition by way of punishment or of reward. The very idea of a god, as creating or in any way

ruling the world, is utterly absent in the Buddhist system. God is not so much as denied: he is simply not known. Contrary to the opinion once confidently and generally held, that a nation of atheists never existed, the Buddhist peoples are essentially atheist; for they know no beings with greater supernatural power than any man is supposed capable of attaining to by virtue, austerity, and science. Indeed some of the Buddhist nations—the Chinese, Mongols, and Tibetans—have no word in their languages to express the notion of God as supreme ruler. The future condition of the Buddhist, then, is not assigned him by the Ruler of the universe; his *karma* determines it by a sort of virtue inherent in the nature of things—by the blind and unconscious concatenation of cause and effect. But the laws by which consequences are regulated seem dark, and even capricious. A bad action may lie dormant, as it were, for many existences; the taint, however, is there, and will some time or other break out. A Buddhist is thus never at a loss to account for any calamity that may befall himself or others.

Another basis of Buddhism is the assumption that human existence is on the whole miserable, and a curse rather than a blessing (see PESSIMISM). This notion, or rather feeling, is, like transmigration, common to Buddhism and Brahmanism, and is even more prominent in Buddhism than in the old faith. It is difficult for a European to conceive this state of mind, or to believe that it can be habitual in a whole people; and many signal errors in dealing with the Indian nations have arisen from overlooking the fact. The cause would seem to lie largely in the comparatively feeble physical organisation of Easterns in general, together with that want of security and peace, and that habitual oppression of the many by the few, with all the attendant degradation and positive suffering, which was long the normal state of things in India. The little value that Hindus set upon their lives is manifested in many ways. The punishment of death has little or no terror for them, and is even sometimes coveted as an honour. For, in addition to the little value of their present existence, they have the most undoubting assurance that their soul, if dislodged from its present tenement, will forthwith find another, with a chance, at least, of its being a better one.

In the eyes, then, of the Sakya-muni and his followers, sentient existence was hopelessly miserable. Misery was not a mere taint in it, the removal of which would make it happy; misery was its very essence. Death was no escape from this inevitable lot; for, according to the doctrine of transmigration, death was only a passage into some other form of existence equally doomed. Even the heaven and the state of godhead which form part of the cycle of changes in this system were not final; and this thought poisoned what happiness they might be capable of yielding. Brahman philosophers had sought escape from this endless cycle of unsatisfying changes by making the individual soul be absorbed in the universal spirit (see BRAHMA). Gautama had the same object in view—viz. exemption from being born again; but he declared the Brahmanic penances inadequate to accomplish this. His philosophy was utterly atheistic, like that of the original Sankhya school of philosophy, with which it is most closely connected, and ignored a supreme God or Creator; it did not leave even an impersonal spirit of the universe into which the human soul could be absorbed. Gautama sees no escape but in what he calls Nirvana, the exact nature of which has been matter of dispute. According to its etymology, the word means 'extinction,' 'blowing out,' as of a candle; and in the

Buddhist scriptures generally it is equivalent to the cessation of individual existence. Even in those schools which have attempted to draw a distinction, the distinction is of the most evanescent nature.

The key of the whole scheme of Buddhist salvation lies in what Gautama called his Four Sublime Verities. The first asserts that pain exists; the second, that the cause of pain is desire or attachment—the meaning of which will appear further on; the third, that pain can be ended by Nirvana; and the fourth shows the way that leads to Nirvana. This way to Nirvana consists in eight things: right views, right feelings, right words, right behaviour, right exertion, right obedience, right memory, and right meditation. The immediate cause of pain is birth, for if we were not born we should not be exposed to death or any of the ills of life. Birth, again, is caused by previous existence; it is only a transition from one state of existence into another. A sentient being consists of an assemblage of material qualities, sensations, ideas, tendencies, and mental powers, none of which are permanent, but dissolve at death. What alone is permanent is the being's *karma*. It does not die. But for it there would be freedom from existence. The cause of existence is a 'grasping state of mind,' or attachments, good and bad. These depend upon desire. We thus arrive at desire—including both the desire to possess and the desire to avoid—as one link in the chain of causes of continued existence and pain. Desire is said to be caused by sensation, sensation by contact, and so on until we come to ideas. Ideas, however, are mere illusions, the results of ignorance or error, attributing durability and reality to that which is transitory and imaginary. Cut off this ignorance, bring the mind into a state in which it can see and feel the illusory nature of things, and forthwith the whole train vanishes; illusory ideas, distinction of forms, senses, contact, sensation, desire, attachment, existence, birth, misery, old age, death!

Morality and Religious Observances.—The eight parts or particulars constituting the theoretical 'way' (to Nirvana), were developed by Gautama into a set of practical precepts enjoining the various duties of common life and of religion. They are all ostensibly intended as means of counteracting or destroying the chain of causes that tie men to existence and necessitate being born again, especially that most important link in the chain constituted by the attachments or desires resulting from former actions; although the special fitness of some of the precepts for that end is far from being apparent. It is easy to understand how the austerities that are prescribed might subdue the passions and affections, and lessen the attachment to existence; but how the exercise of benevolence, of meekness, of regard to truth, of respect to parents, &c. on which Gautama laid so much stress, should have this effect, it is difficult to conceive. Luckily for the Buddhist world, Gautama's moral nature was better than his logic; and as he felt strongly that these things are essentially right and good, he takes it for granted that they must contribute to what was in his eyes the chief good—escape from existence, or Nirvana. In delivering his precepts, the Buddha considers men as divided into two classes—those who have embraced the religious life (*Sramanas*), and those who continue in the world, or are laymen. These last are considered as too much attached to existence to feel any desire or have any hope of emancipation, at least at this stage. But there are certain precepts which it is necessary for all to obey, that they may not bring greater misery upon themselves in their next births, and rivet the bonds of existence more indissolubly.

There are ten moral precepts or 'precepts of aversion.' Five of these are of universal obligation—viz. not to kill; not to steal; not to commit adultery; not to lie; not to be drunken. Other five are for those entering on the direct pursuit of Nirvana by embracing the religious life: to abstain from food out of season—that is, after mid-day; to abstain from dances, theatrical representations, songs, and music; to abstain from personal ornaments and perfumes; to abstain from a lofty and luxurious couch; to abstain from taking gold and silver. For the regular ascetics or monks there are a number of special observances of a very severe kind. They are to dress only in rags, sewed together with their own hands, and to have a yellow cloak thrown over the rags. They are to eat only the simplest food, and to possess nothing except what they get by collecting alms from door to door in their wooden bowl. They are allowed only one meal, and that must be eaten before mid-day. For a part of the year, they are to live in forests, with no other shelter than the shadow of a tree, and there they must sit on their carpet even during sleep, to lie down being forbidden. They are allowed to enter the nearest village or town to beg food, but they must return to their forests before night.

Besides the absolutely necessary 'aversions and observances' above mentioned, the transgression of which must lead to misery in the next existence, there are certain virtues or 'perfections' of a supererogatory or transcendent kind, that tend directly to 'conduct to the other shore' (Nirvana). The most essential of these are almsgiving or charity, purity, patience, courage, contemplation, and knowledge. Charity or benevolence may be said to be the characteristic virtue of Buddhism—a charity boundless in its self-abnegation, and extending to every sentient being. The benevolent actions done by the Buddha himself, in the course of his many millions of migrations, were favourite themes with his followers. On one occasion, seeing a tigress starved and unable to feed her cubs, he hesitated not to make his body an oblation to charity, and allowed them to devour him. Benevolence to animals, with that tendency to exaggerate a right principle so characteristic of the East, is carried among the Buddhist monks to the length of avoiding the destruction of fleas and the most noxious vermin, which they remove from their persons with all tenderness.

There are other virtues of a secondary kind, though still highly commendable. Thus, not content with forbidding lying, the Buddhist strictly enjoins the avoidance of all offensive and gross language, and of saying or repeating anything that can set others at enmity among themselves; it is a duty, on the contrary, especially for a *sramana*, to act on all occasions as a peacemaker. Patience under injury, and resignation in misfortune, are strongly inculcated. Humility, again, holds a no less prominent place among Buddhist graces than it does among the Christian. The Buddhist saints are to conceal their good works, and display their faults. As the outward expression of this sentiment of humility, Gautama instituted the practice of confession. Twice a month, at the new and at the full moon, the monks confessed their faults aloud before the assembly. If these were slight, some slight penance was imposed, such as sweeping the courtyard of the monastery. This humiliation and repentance seems the only means of expiating sin that was known to Gautama. Confession was exacted of all believers, only not so frequently as of the monks. The edicts of Piyadasi recommend a general and public confession at least once in five years.

Such are the leading features of the moral code of the Buddha, of which it has been said that 'for pureness, excellence, and wisdom, it is second only to that of the Divine Lawgiver himself.' But the original morality of Buddhism has, in the course of time, been disfigured by many subtleties, puerilities, and extravagances, derived from the casuistry of the various schools of later times; just as the casuistry of the Jesuits, for instance, perverted many of the precepts of Christianity. The theory on which the Buddha founds his whole system gives, it must be confessed, only too much scope to such perversions; for, on that theory, truth is to be spoken, self to be sacrificed, benevolence to be exercised, not for the sake of the good thus done to others, but solely for the effect of this conduct on the soul of the actor, in preparing him for escape from existence. To teach men 'the means of arriving at the other shore' was another expression for teaching virtue; and that other shore was annihilation. On this principle, the Buddhist casuist can, like the Jewish, render of none effect the universal law of charity and the duty of respecting and aiding parents, on which the Buddha laid such stress. Thus, a Bhikshu—i.e. one who has engaged to lead a life of self-denial, celibacy, and mendicancy, and is thus on the high-road to Nirvana—is forbidden to look at or converse with a female, lest any disturbing emotion should ruffle the serene indifference of his soul; and so important is this, that 'if his mother have fallen into a river, and be drowning, he shall not give her his hand to help her out; if there be a pole at hand, he may reach that to her; but if not, she must drown' (Wilson).

Contemplation and science or knowledge (i.e. of the concatenation of causes and effects) are ranked as virtues in Buddhism, and hold a prominent place among the means of attaining Nirvana. It is reserved, in fact, for abstract contemplation to effect the final steps of the deliverance. Thought is the highest faculty of man, and, in the mind of an Eastern philosopher, the mightiest of all forces. A king who had become a convert to Buddhism is represented as seating himself with his legs crossed and his mind collected; and 'cleaving with the thunderbolt of science the mountain of ignorance,' he saw before him the desired state. It is in this cross-legged, contemplative position that Sakya-muni is almost always represented in that crowning intellectual act of his, when, seated under the Bo-tree, he attained the full knowledge of the Buddha, saw the illusory nature of all things, broke the last bonds that tied him to existence, and stood delivered for evermore from the necessity of being born again.

'Complete' Nirvana or extinction cannot, of course, take place till death; but this state of preparation for it, called simply Nirvana, seems attainable during life, and was, in fact, attained by Gautama himself. The process by which the state is attained is called *Dhyana*, and is neither more nor less than ecstasy or trance, which plays so important a part among mystics of all religions. The individual is described as losing one feeling after another, until perfect apathy is attained, and he reaches a region 'where there are neither ideas, nor the idea of the absence of ideas!'

The *ritual* or *worship* of Buddhism—if worship it can be called—is very simple in its character. There are no priests or clergy properly so called. The *Sramanas* or *Bhikshus* (mendicants) are simply a religious order—a kind of monks who, in order to the more speedy attainment of Nirvana, have entered on a course of greater sanctity and austerity than ordinary men; they have no sacraments to administer or rites to perform for the people, for every Buddhist is his own priest. The only thing

like a clerical function they discharge, is to read the scriptures or discourses of the Buddha in stated assemblies of the people held for that purpose. They have also everywhere, except in China, a monopoly of education; and thus in Buddhist countries education, whatever may be its quality, is very generally diffused. In some countries the monks are exceedingly numerous; around Lassa in Tibet, for instance, they are said to be one-third of the population. They live in *viharas* or monasteries, and subsist partly by endowments, but mostly by charity. Except in Tibet, they are not allowed to engage in any secular occupation. The vow is not irrevocable. This incubus of monachism constitutes the great weakness of Buddhism in its social aspect. See BURMA, CHINA, JAPAN, LAMAISM, &c.

The adoration of the statues of the Buddha and of his relics is the chief external ceremony of the religion. This, with prayer and the repetition of sacred formulas, constitutes the ritual. The centres of the worship are the temples containing statues, and the topes or tumuli erected over the relics of the Buddha, or of his distinguished apostles, or on spots consecrated as the scenes of the Buddha's acts. The central object in a Buddhist temple, corresponding to the altar in a Roman Catholic church, is an image of the Buddha, or a dagoba or shrine containing his relics. Here flowers, fruit, and incense are daily offered, and processions are made with singing of hymns. The quantity of flowers used as offerings is prodigious. A royal devotee in Ceylon, in the 15th century, offered on one occasion 6,480,320 flowers at the shrine of the tooth. At one temple it was provided that there should be offered 'every day 100,000 flowers, and each day a different flower.' Of the relics of the Buddha, the most famous are the *teeth* that are preserved with intense veneration in various places. Hwen-Thsang saw more than a dozen of them in different parts of India; and the great monarch Siladitya was on the eve of making war on the king of Kashmir for the possession of one, which was in consequence given up. The tooth of the Buddha preserved in Ceylon, a piece of ivory about the size of the little finger, is exhibited very rarely. See CEYLON.

There appears at first sight to be an inconsistency between this seeming worship of the Buddha and the theory by which he is considered as no longer existing. Yet the two things are really not irreconcilable; not more so, at least, than theory and practice often are. With all their admiration of the Buddha, his followers have never made a god of him. Gautama is only the last Buddha—the Buddha of the present cycle. He had predecessors in the cycles that are past (twenty-four Buddhas of the past are enumerated, and Gautama could even tell their names); and when, at the end of the present cycle, all things shall be reduced to their elements, and the knowledge of the way of salvation shall perish with all things else, then, in the new world that shall spring up, another Buddha will appear, again to reveal to the renescent beings the way to Nirvana. Gautama foretold that Mitreya, one of his earliest adherents, should be the next Buddha (the Buddha of the future), and he gratified several of his followers with a like prospect in after-cycles. The Buddha was thus no greater than any mortal may aspire to become. The prodigious and supernatural powers which the legends represent him as possessing are quite in accordance with Indian ideas; for even the Brahmans believe that by virtue, austerities, and science, a man may acquire power to make the gods tremble on their thrones. One who is on the way to become a supreme Buddha, and has arrived at that stage when he has only one more birth to undergo, is

styled a *Bodhisatva* (having the essence of knowledge); a mere candidate for Nirvana is an *arhat* (venerable).

The Buddha, then, is not a god; he is the ideal of what any man may become; and the great object of Buddhist worship is to keep this ideal vividly in the minds of the believers. In the presence of the statue, the tooth, or the footprint, the devout believer vividly recalls the example of him who trod the path that leads to deliverance. This veneration of the memory of Buddha is perhaps hardly distinguishable among the ignorant from worship of him as a present god; but in theory, the ritual is strictly commemorative, and does not necessarily involve idolatry any more than the garlands laid on the tomb of a parent by a pious child. See TOPE.

The prayers addressed to the Buddha are more difficult to reconcile with the belief in his having ceased to exist. It is improbable, indeed, that the original scheme of Buddhism contemplated either the adoration of the statues of the Buddha or the offering of prayers to him after his death. These are an after-growth—accretions upon the simple scheme of Gautama, and in a manner forced upon it during its struggle with other religions. For a system of belief that seeks to supplant other systems finds itself enticed to present something to rival and outdo them, if possible, in every point. Even the Christian church in the middle ages adopted with this view rites and legends of paganism; merely casting over them a slight disguise, and giving them Christian names. Prayer, too, is natural to man. And then the inconsistency of uttering prayers when there is no one to hear or answer, glaring as it may appear to some, is by no means great to the Eastern mind. Prayers, like other sacred formulas, are conceived less as influencing the will of any superior being to grant the request, than as working in some magical way—producing their effects by a blind force inherent in themselves. They are, in short, mere incantations or charms. Even the prayers of a Brahman, who believes in the existence of gods, do not act so much by inclining the deity addressed to favour the petitioner, as by compelling him through their mysterious potency—through the operation of a law above the will of the highest gods. The Buddhist, then, may well believe that a formula of prayer in the name of 'the Venerable of the world' will be potent for his good in this way, without troubling himself to think whether any conscious being hears it or not.

The element in Buddhism which more than any other, perhaps, gave it an advantage over all surrounding religions, and led to its surprising extension, was the spirit of universal charity and sympathy that it breathed, as contrasted with the exclusiveness of caste. In this respect, it held much the same relation to Brahmanism that Christianity did to Judaism. It was, in fact, a reaction against the exclusiveness and formalism of Brahmanism—an attempt to render it more catholic, and to throw off its intolerable burden of ceremonies. Buddhism did not expressly abolish caste, but only declared that all followers of the Buddha who embraced the religious life were thereby released from its restrictions; in the bosom of a community who had all equally renounced the world, high and low, the twice-born Brahman and the outcast were brethren. This was the very way that Christianity dealt with the slavery of the ancient world. This opening of its ranks to all classes and to both sexes—for women were admitted to equal hopes and privileges with men, and one of Gautama's early female disciples is to be the supreme Buddha of a future cycle—no

doubt gave Buddhism one great advantage over Brahmanism. The Buddha, says Max Müller, 'addressed himself to castes and outcasts. He promised salvation to all; and he commanded his disciples to preach his doctrine in all places and to all men. A sense of duty, extending from the narrow limits of the house, the village, and the country, to the widest circle of mankind, a feeling of sympathy and brotherhood towards all men, the idea, in fact, of humanity, were first pronounced by Buddha.' This led to that remarkable missionary movement, already adverted to, which, beginning 300 B.C., sent forth a succession of devoted men, who spent their lives in spreading the faith of Buddha over all parts of Asia.

In the characteristic above mentioned, and in many other respects, the reader cannot fail to remark the striking resemblance that Buddhism presents to Christianity, and this in spite of the perverse theory on which it is founded. On the other hand, by giving prominence to the extravagances and almost inconceivable puerilities and absurdities with which the system has been overloaded, it would be easy to make it look sufficiently ridiculous. But this is not to depict, it is to caricature. The only fair—the only true account of any religion, is that which enables the reader to conceive how human beings may have come to believe it and live by it. It is this object that has been chiefly kept in view in this meagre sketch of a vast subject.

For the history of the Buddha and his religion, see Burnouf, *Introduction à l'Histoire du Bouddhisme Indien* (1876); Köppen, *Die Religion des Buddha* (1857); Oldenberg, *Buddha* (1881; Eng. trans. 1882); Wurm, *Der Buddha* (1890); St-Hilaire, *Le Bouddha* (1862); Wassiljew, *Der Buddhismus* (1860); Kern, *Geschiedenis van het Buddisme* (1884); the various works by Rhys Davids (1880-1908); by Lillie; the lives by Beal (1875) and Rockhill (1884); Arnold, *The Light of Asia* (1882); Titcomb, *Buddhism* (1885); Bastian, *Der Buddha in seiner psychologie* (1882); Alvis, *Buddhist Nirvana* (1871); Sénart, *La Légende du Bouddha* (1875); Bigandet, *Legend of Gaudama* (1886); Oby, *Du Nirvana Bouddhique* (1863); Max Müller, *Buddhist Nihilism* (1869); Seydel, *Das Evangelium und die Buddhasage* (1882); Eitel, *Buddhism* (1873); Kistner, *Buddha* (1869), with a complete bibliography; Sir Monier Williams, *Buddhism* (1888); the works of Beal, Edkins, Eitel, Legge, and Schott for Chinese Buddhism; of Köppen and Schlagintweit for Tibetan; and of Alabaster for Siamese.

The following are some of the principal translations of, or compilations from original works in Pali, Sanskrit, Tibetan, and Chinese: Spence Hardy, *Manual of Buddhism* (1860), *Eastern Monachism* (1860), and *Legends and Theories of the Buddhists* (1866); Burnouf, *Le Lotus de la Bonne Loi* (1852); Schiefner, *Taranatha's Geschichte des Buddhismus* (1869) and *Lebensbeschreibung Sakjamunis* (1849); Rhys-Davids, *Buddhist Birth Stories*, vol. i. (1880); Rogers, *Buddhaghosha's Parables* (1870); Foucaux, *Histoire du Bouddha* (1868); *Fa Hian's Travels*, translations by Rémusat, Beal, Giles, and Legge; *Hiouen-Thsang's Travels* by Stan. Julien and Beal; *Lalita Vistara* by Raj. Mitra and Lefmann; *Dhammapada* by Fausbøll, Müller, Beal, Rockhill, Weber, and Schulze; parts of the canon in *Sacred Books of the East*, vols. x. xi. xiii. xvii. xix. and xxi.; other parts by C. Swamy, Childers, and Beal; *I Discorsi di Gotama Buddha*, translated into Italian from the Pali by Neumann and Lorenzo (Bari, 1907).

Buddhism, ESOTERIC. See THEOSOPHY.

Budding, a process in the propagation of ligneous plants analogous to Grafting (q.v.). It consists in the transferring of a bud from one shoot to another on the same or a different plant. Although chiefly employed in gardens as a rapid, economical method of increasing new and choice or rare kinds of fruit-trees and flowering trees and shrubs, it may also be used to improve the fruitfulness of barren fruit-trees, it being quite practicable to insert

blossom-buds into the branches of trees that are deficient in them. *Shield-budding*, which is the most commonly practised of several modes, is preferred for fruit-trees with gummy sap, such as the plum, cherry, peach, and apricot, as it lessens the tendency in such trees to canker at the wounded parts. It may be performed at any time when the bark rises freely from the young wood. This it usually does from June to September, but the fitness of the bud for the operation is to be judged of solely by the freedom with which the bark separates from the wood. The bud must be well formed, but not necessarily mature. The subjoined cut



represents the various parts in the mode known as *shield-budding*: *a* is the bud cut out, with a shield of bark attached to it; *b*, the stock, with a slit in the bark to receive the shield and bud; *c*, the bud inserted and the leaf cut away. The bud is cut by means of a sharp knife from the branch on which it has grown—usually a branch of the current year's growth—a small portion of the bark and wood being taken together, extending to about half an inch above and three-quarters of an inch below the bud. The woody part is then removed from the bark, taking care to prevent the base or root of the bud from being injured. If injured, the base will present the appearance of a circular cavity, which is caused by the removal of the centre or growing point of the bud, in which case it is worthless, and should be thrown away. A longitudinal and a transverse cut in the form of the letter T, as shown at *b*, are then made in the bark of the stock to receive the bud; the thin ivory point of the handle of the budding-knife is used to raise the bark, and the bud is inserted. The bark extending above the bud is then cut over so as to fit exactly the transverse cut in the stock. A strand of soft matting or soft cotton-yarn is then wound firmly but not tightly around the stock to bind the bark down on that of the bud, in order to keep the latter in its place and prevent the access of dry air or heavy rains to the wounds. Of other methods of budding, the *reversed shield* is that commonly used by nurserymen and gardeners about Genoa in the rearing of orange-trees. The only difference between this and the mode first described is that the transverse cut in the stock is made at the bottom instead of the top of the longitudinal one. *Scallop-budding* is another mode in which the wood adhering to the bark of the bud is not removed, but instead is carefully fitted to a corresponding section in the stock, made by the removal of a portion of the bark and wood. The fitting of the edges of the bark of the bud to that of the stock is essential to success in practising this method, but it is altogether less sure than ordinary *shield-budding*. It may, however, be performed in spring, and if it fails, the object in view may be attained by the other method during summer and autumn.

Buddleia, a genus of shrubs of the order Loganiaceae, of which eighty species are known, all natives of the warmer parts of the world, and some of them much admired for their beautiful flowers. *B. globosa* (Chile), with globose heads of orange-coloured flowers, is hardy enough to endure the climate of most parts of England, and

several half-hardy species have also been introduced.

Budé, GUILLAUME. See BUDÆUS.

Bude, a watering-place on the north coast of Cornwall, 17 miles NNW. of Launceston. Pop., with Stratton, 4000. Bude Castle was the home of Sir G. Gurney, who in 1839-41 patented the *Bude burner*, consisting of two, three, or more Argand (q.v.) burners, each inner one a little above the outer.

Budejovice. See BUDWEIS.

Budge, SIR ERNEST A. WALLIS, keeper of Assyrian and Egyptian antiquities in the British Museum, born in 1857, studied at Cambridge, excavated at Aswan, Meroe, Nineveh, and elsewhere, and wrote and edited much on relevant subjects.

Budgell, EUSTACE (1686-1736), was born at Exeter, a cousin of Addison's, and from Trinity College, Oxford, proceeded to the Inner Temple. He lost £20,000 by the South Sea Bubble, from a contributor to the *Spectator* degenerated to a Grub Street hack, and at last drowned himself in the Thames.

Budgerigar is a kind of Parrakeet (q.v.).

Budget, from the same source as the French *bougette*, means a small bag, and has been used metaphorically to express a compact collection of things, as a budget of news, a budget of inventions, and the like. Water-budgets or buckets were a very honourable blazon on a coat-armorial, as being generally conferred in honour of some valiant feat for supplying an army with water.

The term 'The Budget' is in Britain, from long usage, applied to that miscellaneous collection of matters which aggregate into the annual financial statement made to parliament by the Chancellor of the Exchequer. It contains two leading elements—a statement how the nation's account of charge and discharge stands in relation to the past, and an explanation of the probable expenditure of the ensuing year, with a scheme of the method in which it is to be met, whether by the existing or new taxes, or by loan. The statement of the budget is always an important, sometimes a very exciting, occasion; as, for instance, Sir Robert Peel's adoption of an income-tax in 1842, and his legislation for free-trade in 1846. Mr Gladstone's eight budgets (1859-66), when Chancellor of the Exchequer in Lord John Russell's government, have always been considered as models of financial exposition. Sir Wm. Harcourt's of 1894, and Mr Lloyd George's of 1909, were memorable. See REVENUE. For a critical examination, see Bernard Mallet, *British Budgets, 1887-8: 1912-13*; and for the war period, Professor J. S. Nicholson, *War Finance* (1918).

Budh Gaya. See BUDDH GAYA.

Budrun, or BUDRUM, a seaport town of Asia Minor, on the north shore of the Gulf of Kos, about 96 miles S. of Smyrna. It is the site of the ancient *Halicarnassus* (q.v.), the birthplace of Herodotus and Dionysius. Pop. about 6000.

Budweis (Czech *Budejovice*), a town of Bohemia, on the navigable Moldau, 133 miles NW. of Vienna by rail. It has a cathedral, with a detached belfry dating from about 1550; manufactures of stoneware, machines, lead-pencils, saltpetre, &c.; besides a brisk trade in grain, wood, coal, and salt. Pop. 44,000. In the neighbourhood is Schloss Frauenberg (1840-47), the seat of the Schwarzenberg family.

Buea, formerly capital of Cameroon, now in the British mandatory territory, stands on the seaward slope of the Cameroon mountain.

Buelow. See BÜLOW.

Buen-Airé (Span.), Fr. BONAIRE, a West Indian island, 60 miles from the coast of Vene-

zuela, and 30 E. of Curacao, like which it belongs to the Dutch. It produces timber, cattle, cochineal, and salt. Area, 100 sq. m.; pop. 7000.

Buenaventura, a town on the Pacific coast of the republic of Colombia. It has a hot, sickly climate, but is the port for the healthy and rich Cauca valley. Pop. 5000.

Buena Vista, a village of Mexico, 7 miles S. of Saltillo, where, on February 22-23, 1847, some 5000 United States troops under Taylor defeated 20,000 Mexicans under Santa Anna.

Buenos Aires (often spelled *Buenos Ayres*), the largest and most important province of the Argentine Republic in South America, extending along the Atlantic, from the mouth of the Plata to that of the Río Negro on the 41st parallel. On the NE. it is washed by the river Plate (Plata) and the Paraná, the latter separating it from the province of Entre Ríos. Its area is estimated at 118,000 sq. m., almost equal to that of the British Islands; its population, 648,140 in 1885, was at the census of 1914 over 2,000,000, and was estimated in 1919 at 2,279,500. With a much larger area it was originally an appendage of Peru, and became in 1775 a separate viceroyalty of itself. 'The United Provinces of the Plata' continued down to 1853 to recognise the city of Buenos Aires as their head; and after the constitution of the Republic, the inland states endeavoured both by war and diplomacy to reannex the maritime province. Their object was attained in 1860, and the city remained capital of the province and temporary capital of the confederation until it was federalised in 1880, the seat of the provincial government being removed to La Plata, 30 miles to the south-east, in 1884.

The country is so flat that most of the rain which falls is either absorbed or evaporated, or lost in salt-lakes, comparatively little drainage entering the Paraná or the Plata; the largest rivers, the Salado (360 miles), and the Colorado (700) in the south, empty into the Atlantic. The climate, though on the whole healthy and agreeable, is yet by no means steady or uniform. Every wind, in general, has, to a remarkable degree, its own weather—sultriness coming from the north, freshness from the south, moisture from the east, and the dry and piercing *pampero* winds from the west; and besides the periodical heats of every summer, successive years of more than ordinary drought occur. The rainfall ranges from 19 inches at Bahía Blanca to 38 at Matanzas; snow falls only in the far south, though thin ice is occasionally seen, the temperature ranging from 24° to 108° F. Agriculture is carried on all over the province, and is the chief source of wealth. Practically all the land is divided up by wire fences. It has greatly increased in value. The province contains well-nigh half of the sheep of the republic. Its interior presents almost uninterrupted pasturage to countless herds of horses and cattle, and the business of grazing occupies or interests the great bulk of the population; but the droughts that affect the high northern camps, as well as the frequent inundations to which the low-lying southern camps are exposed, are often more destructive to the herds than the not infrequent plague of locusts is to the crops. The coast-line (740 miles, with about 150 miles on the Paraná) is low and sandy, and the ports of the province are very few. Bahía Blanca, in the extreme south, has an excellent port which is largely frequented, and exports vast quantities of cereals. There is a good harbour at La Plata, and one at San Nicolás on the Paraná, next to those mentioned the most considerable town in the province. Immigration from Europe has been encouraged by legislative enactment; and a comparatively

genial climate is a recommendation to foreigners. The cultivation of wheat and corn has received increased attention, both being raised in large quantities. The shipping and commerce are extensive, being a large proportion of that of the whole republic. The chief exports are wheat, maize, linseed, wool, beef, mutton, hides and other animal products, tanning materials, alfalfa, and hay; the principal imports are food, textiles, oils, iron and its manufactures, pottery, &c. There is steady immigration into the province, in some years exceeding 230,000 (chiefly Italians and Spaniards). Many railways traverse Buenos Aires.

Buenos Aires, the federal capital of the Argentine Republic, on the right bank of the Plata, which lies, at a distance of 150 miles from the open sea, is 30 miles across. The city, which forms a federal district (72 sq. miles), was practically rebuilt during the last twenty years of the 19th century and the early years of the 20th; and the harbour, formerly inaccessible to all but small vessels, has been very greatly improved. Formerly ships drawing more than 15 feet had to anchor 7 or 8 miles from the shore. Improvements were begun in 1887, and resumed in 1910. The port has now two harbour entrances with 24 to 30 feet of water (one 15 miles long and 328 feet wide), and a number of basins, sluice docks, and dry docks, accommodating the largest steamers. Wharves have been constructed on the banks of the Riachuelo, where the great southern railway docks are situated. The port is equipped with very powerful electric and hydraulic cranes, and the newest loading appliances, warehouses, and oil-fuel depots. The water-supply of the city, pure and ample, though delivered under too low a pressure, is drawn from the river Plate, and filtered after treatment with iron alum, and pumped to three great distributing tanks.

Fuel is scarce and dear; and building-stone and timber come mainly by sea, the territory near the city being purely alluvial. A little granite comes from the Tandil, 180 miles to the south. Brick-clay, however, abounds on the spot. The city is regularly laid out in streets intersecting at right angles, through which diagonal avenues are being cut. It is now the largest city in the southern hemisphere, vastly exceeding either Sydney or Melbourne. In 1869 its population was about 178,000, in 1890 about 500,000, in 1910 over 1,302,000, at the census of 1914 1,575,814; in 1920 it was estimated at 1,674,000. About half of the inhabitants are foreign, chiefly Italians and Spaniards. The shore is lined with grain-elevators and great slaughter-houses, and the mean quarters inhabited by Italian labourers. The streets in the centre are narrow, but well paved with asphalt or wood blocks. A great boulevard, the Avenida de Mayo, runs for a mile and a half through the heart of the city. The Calle de Florida is another great thoroughfare. The suburbs are beautiful. There are many plazas and parks, of which the great Palermo Park is very fine. These open spaces are a valuable feature, since blocks of houses from 6 to 13 stories, built of a steel framework faced with stone or stucco, are everywhere springing up in the city. The old Spanish colonial architecture, however, survives alongside the over-sumptuous buildings of the vulgar rich. The poorer classes live in great squalor in districts covered with mud-huts and shanties and unpaved streets.

The principal buildings are the cathedral, second in South America to that of Lima alone; the chapel of Santa Felicitas; Anglican, Lutheran, Methodist, and Presbyterian churches; the university, the congress-hall, a military college, the post-office, an imposing opera-house, the archbishop's palace, the mint and government offices, the exchange, and some of the banks and palatial

railway depots. Many thousands of cattle, sheep, and swine are slaughtered. There are many printing establishments, cigar, carpet, cloth, furniture, and boot and shoe factories. The city is the seat of an archbishopric, and possesses public libraries and museums, hospitals, and numerous other charitable institutions. The terminus of nine railways, it has 500 miles of tramway line, on which 250 million passengers are annually carried, and the first underground railway in South America. About 300 newspapers and periodicals are published in Buenos Aires, including some in Italian, German, English, Scandinavian languages, French, Basque, and Russian. The exports and imports of the port comprise the great bulk of Argentine foreign trade. Buenos Aires was founded in 1535, but was subsequently twice destroyed by the Indians. The French revolutionary wars, in which Spain sided with France, led to British interference with this Spanish colony, considerably to the disadvantage of Britain. In 1806 a British force under General Beresford and Sir Home Popham, which had just captured the city, was obliged to surrender; and in 1807 another, under General Whitelocke, which attempted to recover the place, was repulsed with heavy loss; and these successes over so formidable a foe emboldened the colonists, three years afterwards, to throw off the yoke of Spain. To celebrate the centenary of national independence, a great exhibition was held in 1910.

Buer, a coal-mining town of Prussia, in Westphalia, 10 miles NNE. of Essen; pop. 90,000.

Bufarik. See BOUFARIK.

Buffalo, a city of New York state and capital of Erie county, is at the eastern end of Lake Erie and at the head of the Niagara River, and is named from Buffalo Creek, which here runs into the lake. The city stands 295 miles NW. of New York city in a direct line, but by the Erie Railroad 423 miles; the distance from Chicago is 539 miles. The Erie Canal as reconstructed since 1918 connects it with Troy (350 miles), and so by the Hudson River with New York. In population and wealth Buffalo ranks second among the cities of New York. It has a capacious harbour, which has been dredged so that vessels of 17 feet draught can enter. There is an outer breakwater 4000 feet long, besides other breakwaters, piers, basins, and canals, constructed by the Federal, State, and municipal governments, at an expense of many millions of dollars. The harbour is guarded by Fort Porter, which stands 2 miles out from the heart of the city; close by is the old fort, built in 1812, and now in ruins. Two miles below, at Black Rock, long since included in the city, is the International Iron Bridge by which the Grand Trunk Railroad crosses the Niagara River. The water front of the city extends 5 miles along the lake and river, while Buffalo Creek has been rendered navigable for over a mile. The commercial importance of Buffalo dates from the completion of the Erie Canal in 1825; but since 1862 the lake commerce has yielded to the competition of the railroads. The Board of Trade was incorporated in 1857. The chief business is the receiving, transferring, and storing of grain, which employs numerous elevators, some of them stone structures, others iron and brick. There are also large floaters and transports. The live-stock trade rivals the grain trade in importance; the iron and steel works rank next to those of Pittsburg; and the shipments of Pennsylvania coal, which finds a depot here, have greatly increased in recent years. The lumber trade is also very large and important. The industrial works comprise iron and steel works of various

kinds car-shops, iron ship yards, flour-mills, soap-works, factories for meat products, wooden goods, linseed oil, motor-cars, clothing, agricultural implements, besides many small establishments of all kinds. The navigation of Lake Erie usually opens about the middle of April, the extreme dates being a month earlier and a month later. Main lines of railroad connect Buffalo with New York, Philadelphia, Chicago, and Canada. In November 1896 electric power generated at Niagara Falls was rendered available for factories and tramways in Buffalo. The city has wide streets, well paved and lighted, and generally lined with trees. It has excellent sewerage, and extensive water-works supplied from Niagara River; and its healthfulness is attested by the low death-rate of 14 per 1000. There are five public squares, and the magnificent park consists of three sections, connected by boulevards which encircle the city. Delaware Avenue, the leading street for private residences, is about 3 miles long, and is lined with double rows of trees. Main Street, the principal trading thoroughfare, has many substantial business blocks. The city and county hall is an imposing structure of Maine granite, in the form of a double Roman cross, with a tower 245 feet high, surmounted by four statues. The other prominent buildings are the United States custom-house and post-office, the state arsenal, the county penitentiary, and a state asylum for the insane (in North Buffalo), which has accommodation for 600 patients. At the Pan-American Exposition held here in 1901 President McKinley was assassinated. Of the two finest of its many churches, St. Joseph's Cathedral (Roman Catholic) is a gray Gothic structure; and St Paul's (Episcopal), in brown stone, was partly burned in 1888. The public schools have an average daily attendance of 50,000. The university of Buffalo, organised in 1846, includes a College of Arts and Sciences, and departments of medicine, dentistry, pharmacy, and law. The Catholics, the strongest body in the city, have Canisius College and other schools. There are also a law college and several business colleges. A number of daily newspapers are published, many of them in German. The Grosvenor Free (reference) Library has 130,000 volumes, and there is a public library with over 380,000 volumes, its building giving accommodation also to the rooms and collections of the Buffalo Society of Natural Sciences. Another of Buffalo's learned bodies is the Buffalo Historical Society. The Fine Arts Academy occupies a fine white marble building, in which permanent and special collections are exhibited. There are also a Mechanics' Institute, a Young Men's Christian Union and Catholic Institute. Among the charitable institutions are hospitals, a dispensary, and orphan asylums.

Buffalo was founded in 1801 by the Holland Land Company. It was burned in 1813 by British and Indians. It was incorporated as a city in 1832, and had then a population of 15,000, which had increased in 1850 to 42,300, in 1860 to 81,130, in 1870 to 117,714, in 1880 to 155,137, in 1900 to 352,387, in 1910 to 423,715, and in 1920 to 506,775.

Buffalo, a name often applied to two distinct bovine genera or sub-genera—viz. the Asiatic Buffalo (*Bubalus*) with the Cape Buffalo; and the American Buffalo, better called Bison, and discussed under that head. The genus or sub-genus *Bubalus* has the usual bovine characteristics, and whatever be its exact limits in strict zoological classification, remains for practical purposes a large, clumsy ox. The horns rise from the posterior side corners of the skull, are usually thickened out of proportion at the base, and irregularly ridged, though smooth towards the points; the forehead is short and arched; the covering of hair is comparatively sparse. The

common or Asiatic Buffalo (*B. buffelus*) has beautifully twisted horns, thick and broad at the base, rough on to the middle, somewhat triangular in section. The horns lie back on the shoulders when the animal walks or runs, with its muzzle projecting characteristically forwards. The hair is short and scanty, almost bristly, slightly longer on head, shoulders, and front of neck, and all but black in colour. The bare brown polished hide is, however, the more striking feature.

The animal measures about 7 feet in length, and stands about 4 feet high at the shoulder. It is a native of the East Indies, has been domesticated in India, and thence introduced into Egypt, Greece, Italy, Hungary, &c. It is said to have reached Italy towards the end of the 6th century A.D., and there it has been its fate, as elsewhere, to become a beast of burden. The animal is adapted for marshy situations, which it naturally affects; preferring for its food the rank coarse herbage which they afford, delighting to immerse itself in water till only its head appears above the surface, in which condition it will remain for hours. It often envelops itself in mud as a protection against insects. On account of these propensities, the buffaloes used as beasts of burden in India are seldom laden with any goods liable to be spoiled by water, as the animal is always ready to take an opportunity of lying down with his load in any river or pond which presents itself. In Italy the buffalo seems nowhere more at home than in the Pontine Marshes and the pestilential Maremma.

The buffalo is a very powerful animal, much more powerful than the ox, and capable of dragging or carrying a far heavier load. The female yields a much greater quantity of milk than a cow, and of excellent quality. It is from buffalo milk that the *ghee* or semi-fluid butter of India is made. The hide is greatly valued for its strength and durability, but the flesh is decidedly inferior to that of the ox. The buffalo exhibits a considerable amount of intelligence. In a state of domestication, it is capable of becoming very docile. In a wild state the buffalo is savage and dangerous, and even in domestication it is apt to resent injury. Alone, perhaps, of wild animals in India, it will attack unprovoked. The native princes of India make buffaloes and tigers fight in their public shows; and the buffalo is more than a match for the tiger, even in single combat. The buffalo is used in some parts of the East in the shooting of waterfowl; the sportsman conceals himself behind the animal, which, being a familiar sight, does not alarm the birds.—The Arnee is a very large variety of the common buffalo; a head has been known to measure 13 feet 6 inches along the horns. It occurs in the Indian islands and in Farther India in a wild state, but is also domesticated and used as a beast of burden.

The Cape Buffalo (*Bos caffer*) is generally regarded as a distinct species. The horns are very large; they spread horizontally over the top of the head, and are then bent down laterally, and turned upwards at the point. The head is carried, as by the common buffalo, with projecting muzzle and reclining horns, but the bases of the horns nearly meet on the forehead, where they are from 8 to 10



Head of the Asiatic Buffalo
(*Bubalus buffelus*).

inches broad. The length of a full-grown Cape buffalo is about 8 feet from the root of the horns to the tail, and the height is $5\frac{1}{2}$ feet. This animal



The Cape Buffalo (*Bos capensis*).

is regarded as more formidable than any other in South Africa. The buffalo is still found in large herds in the marshy wooded regions of Mid and South Africa, but in the Cape Province, where it was once plentiful, it has now become comparatively rare. It grazes chiefly in the evening, and lies in woods and thickets during the day. It will readily act on the aggressive, and has never been domesticated. The flesh, though coarse, is palatable.—*B. brachyceros* is another African species.—The Dwarf Wild Cow of the island of Celebes (*Anoa* or *Probubalus celebensis*) is also related to the buffaloes.—See BANTENG, BISON, BOVIDÆ, GAUR, YAK.

Buffalo Berry (*Shepherdia argentea*), an ornamental shrub of the family Eleagnaceæ, with a red or yellow edible fruit resembling the currant, cultivated in NW. North America. It is dioecious, with spines and silvery leaves.

Buffalo Bird. See BEEF-EATER.

Buffalo-nut, or OIL-NUT, the edible fruit of the buffalo-tree, a North American santalaceous shrub (*Pyralaria pubera* or *P. oleifera*), is about the size of a large cherry. The seed yields oil.

Buffalo River, the name of two South African rivers, one of which flows through the south-east of the Cape Province to the Indian Ocean at East London, whose harbour it forms; the other, also called the Umzinyati, in Natal, joins the Tugela 50 miles from its mouth.

Buffer, a mechanical apparatus, consisting usually of a plate or cushion supported by a strong spring, and fixed at the ends of railway carriages and engines, and at termini, to deaden the effect of concussions in starting, slowing, and stopping trains. The name is applied also to simpler devices which sustain the concussion without deadening it. In politics the figurative term buffer-state is applied to a country which is in like manner interposed between the territories of powers that would otherwise be liable to come into collision. The name was early applied to Afghanistan, the buffer-state between India and Russia, and has been extended to Siam, between French and British possessions, and similar states elsewhere.

Buffon, GEORGES LOUIS LECLERC, COMTE DE, was born at Montbard, in Burgundy, on September 7, 1707. His father was a rich man, belonging to the noblesse de robe. After studying law at the Jesuit college in Dijon, he devoted himself wholly to science. At Dijon he became acquainted with

an English nobleman, Lord Kingston, with whom he went on a tour through France and Italy, and in whose company he visited England. While in England he translated into French Newton's *Fluxions*, Hales's *Vegetable Statics*, and a work on agriculture by Tull. On returning to France he soon gained distinction as a writer on scientific subjects, and was in 1739 appointed director of the Jardin du Roi, a post which gave him command of the royal museums and collections of living animals and plants. He then formed the design of his *Histoire Naturelle*, in which all the known facts of natural science were to be embodied and discussed in what he believed to be language of the loftiest eloquence. In producing the fifteen volumes of the *Histoire*, which appeared between 1749 and 1767, he was assisted by Daubenton, the Abbé Bexon, Guesneau de Montbéliard, and others, whom he entrusted with the compilation of facts and the composition of the less ambitious passages. The work brought him an immense reputation, and was translated into most of the languages of Europe. Its rhetorical flights were regarded with extravagant admiration; Rousseau, who visited Buffon at the château of Montbard, is said to have fallen on his knees and kissed the doorstep of the pavilion in which parts of the book were composed. Montesquieu, D'Alembert, and Voltaire, however, formed a different estimate of its author's ability. Though he may be ranked among the *philosophes*, Buffon was not one of the leaders or militant members of the party. He was in 1753 admitted to the Academy. After receiving various high honours, he was made Comte de Buffon by Louis XV. He died at Paris on April 16, 1788. Buffon, it has been said, completely exemplified his own phrase: *Le style est l'homme même*. He was as pompous in his manners as in his writings. He regarded himself as a supreme authority on all that related to literary form; his remark, however, that certain verses which he happened to admire were as beautiful as beautiful prose, illustrates his thorough misunderstanding of the principles of sound criticism. After being greatly overrated, his work is now, perhaps—at least out of France—somewhat unfairly disparaged. He was rash and over-confident in his speculations; his book has no longer any scientific value; much that he wrote and that once passed for soaring eloquence is now recognised as fustian. But he was inspired by a genuine love of knowledge. He sought to invest natural science with new dignity and interest in the eyes of the world at large, and he undoubtedly achieved his object. He may claim a place in the history of the doctrine of evolution, from having opposed the old system of zoological classification, on the ground that an unbroken succession of forms could be traced through the animal kingdom.

See Richard's edition of his *Œuvres complètes* (1825-28), his *Correspondance* (2 vols. 1860); Flourens, *Buffon* (1844); Nadault de Buffon, *Buffon, sa Famille et ses Familiers* (1863); the Life by Lebaston (1889); Packard, *Lamarck* (1902); Mine. Duclaux, *The French Ideal* (1911).

Buffoon is a Jester (q.v.), from the Ital. *buffa*, 'a trick.' From the same word come *buffo*, 'a comic actor or singer,' and the French name, *opéra-bouffe*, for comic opera.

Bug, the name of two European rivers. The Western Bug rises in Eastern Galicia, and after a course of about 470 miles joins the Vistula near Warsaw. The Eastern Bug, the Hypanis of the ancients, rises in Podolia, and flows 520 miles south-east into the estuary of the Dnieper.

Bug, a popular name for insects in the order Hemiptera, and in the subdivision with unequal wings—Heteroptera. It may be widely applied to

the whole of this subdivision, including land-bugs and water-bugs, the former to the number of almost 8000 species, the latter much less numerous. The Boat-fly (q.v.) or water-boatman has been already described, and may, along with the water-scorpions (*Nepidae*, q.v.), serve to illustrate the water-bugs. The Geocôres or land-bugs vary considerably, but have large long feelers with four or five joints, are especially at home in warm countries, are often brightly coloured, have an unpleasant smell, and usually eat other insects or sometimes also the juices of plants. The bug *par excellence*, however, is the

Cimex or *Acanthia lectularia*, the well-known bed-bug. It was known to the Greeks as *Koris*, to the Romans as *Cimex*, and was believed by Aristotle to arise spontaneously from sweat. It is a wingless insect, thus differing from most of its fellow bugs. The body is very flat, the long slender feelers and the legs with fine hairs, the posterior part of the body



Cimex lectularia.

almost circular. The length is about $\frac{1}{16}$ of an inch. The colour is rusty red, with traces of yellow. The mouth is suctorial. During the day the insect lurks quietly in crevices of walls and bedsteads, but is active and hungry at night, sucking the blood of higher animals, and notoriously of man. Since such opportunities but rarely occur, the animal prepares for long fasting by distending itself with blood when a meal is offered. As pests, they are too well known, especially where the furniture is not kept clean, and exasperated sleepers are no longer able to console themselves with the old belief that the bite was an antidote to the venom of snakes. The female bug is said to lay eggs four times between March and September, and each time about fifty. The larvæ are in most respects like the adult, the metamorphosis being incomplete. The first three broods, each reaching sexual maturity in about eleven weeks, develop, the last brood appears to perish, while the adult insects persist through the winter, enduring a considerable degree of cold. The bed-bug is said to have come from the East, and it certainly follows human migration. It was not known in Strasburg, according to *Leunis (Synopsis des Thierreichs)*, till the 11th century, and the refugee Huguenots have been blamed for bringing it to London. Strict cleanliness is the best preventive; turpentine and even corrosive sublimate are among the recommended insecticides. The same species is known to attack pigeons, and other species trouble bats and swallows. For an account of the bug family as a whole, systematic works on insects must be consulted. Many of the thousand forms have some scientific interest and practical importance. A large number may be studied on our common plants and trees. Some of the winged wood-bugs or field-bugs are capable of inflicting very painful wounds. Forms an inch in length are known to occur. Flying-bugs, 'enormous and fetid,' are among the pests of India. Night is the time of their activity. Warm countries generally have winged bugs of great size and beauty; but if touched or irritated, they 'exhale an odour that, once perceived, is never after forgotten.' A winged bug, as large as a cockchafer, lodges in the thatch and roofing of houses in Chile, and sallies forth at night, like the bed-bug, to suck blood, of which it takes as much as a common leech.—It is worthy of notice that a species of field-bug (*Acanthosoma*

griseum), a native of Britain, is one of the few insects that have yet been observed to show affection and attention to their young. De Geer observed the female of this species, which inhabits the birch-tree, conducting a family of thirty or forty young ones as a hen does her chickens, showing great uneasiness when they seemed to be threatened with danger, and waiting by them instead of trying to make her own escape.

Bugbane, or **BUGWORT** (*Cimicifuga*), a fetid genus of Ranunculaceæ, allied to Baneberry (*Actæa*), of which both the European and American species are said to drive away insects.

Bugeaud, THOMAS, French marshal, was born at Limoges in 1784, and entering the army in his nineteenth year, showed such bravery during the Napoleonic campaigns as by 1814 earned him a colonelcy. Recalled from a fifteen years' retirement to active life by the July revolution of 1830, he was elected deputy for Périgueux, and soon gained Louis-Philippe's esteem; in 1836 was despatched to Algeria, where he distinguished himself against Abd-el-Kader; and in 1840 was appointed governor-general. The Zouaves owed their organisation to him. His victory at Isly in 1844 over the emperor of Morocco's forces gained him the title Duc d'Isly, and the year before he had received the marshal's bâton. In the revolution of February 1848 he commanded the army in Paris. He died of cholera in Paris, June 9, 1849. See his *Memoirs* by Count d'Ideville (Eng. trans. 2 vols. 1882); and *Roches, Le Maréchal Bugeaud en Afrique* (1885).

Bugenhagen, JOHANN, surnamed *Doctor Pomeranus* or *Pommer*, one of Luther's chief helpers in the Reformation, was born in 1485 near Stettin, in Pomerania, studied at Greifswald, and as early as 1503 became rector of the Treptow academy. In 1520 his religious views were changed by reading Luther's little book, *De Captivitate Babylonica*. He now betook himself to Wittenberg, where he busied himself in preaching and teaching in the university. His great talent for organisation found work to do in establishing churches in Brunswick, Hamburg, Lübeck, and Pomerania, and in reforming the ecclesiastical establishments of Denmark, whither he was called by Christian III. in 1537. He died 20th April 1558. Bugenhagen aided Luther in his translation of the Bible. Of his own works the best is his *Interpretatio in Librum Psalmorum* (1523). His Life has been written by Bellermann (1859), Vogt (1868), Zitzlaff (1885), Hering (1888), and Graepff (1897).

Bugge, ELSEUS SOPHUS, a Norwegian philologist, born 5th January 1833 at Laurvik, studied at Christiania, Copenhagen, and Berlin, and in 1866 was appointed professor of Comparative Philology and Old Norse at the university of Christiania. His *Old Norse ballads* (1858) and historical legends (1864-65), critical edition of the earlier *Edda* (1867), studies in ancient Italian dialects (1878) and on the origin of the Scandinavian legends of gods and heroes (1881-82), besides numerous dissertations on all departments of the Teutonic and Romance languages, put him in the first rank of philologists. He died in July 1907.

Buggy (an Indian word) is a gig with a hood in India; in England it is a light two-wheeled vehicle without a hood; but in the United States is a light one-horse four-wheeled vehicle with a hood.

Bugis. See **BONI**.

Bugle (*Ajuga*), a palaearctic genus of Labiatæ. The Common Bugle (*A. reptans*) is abundant in moist pastures and woods of Europe. Its flowers are generally blue, but white and purplish varieties are sometimes grown in flower-borders. *A. alpina* is one of the beautiful flowers of the Swiss Alps.

Bugle (Fr. *bugle*; Ger. *flügelhorn*; Ital. *tromba*), a treble musical instrument with a cup mouthpiece, usually made of copper, with strengthening pieces of brass soldered on where most exposed to wear. The bell is less expanded than the Trumpet (q.v.), and the tube is shorter and more conical. (Compare the figure with those in the articles CORNET and TRUMPET.) This form gives it that peculiar,



Bugle.

penetrating, and far-reaching sound which renders it so admirably suited for its sole purpose—viz. a military signalling instrument. The bugle was formerly used only in the infantry branch of the service; but it has now superseded the trumpet for field duty in the cavalry and artillery branches.

It is made in the key of B $\flat$, and its notes are the

open notes of the tube—C (below the stave), G, C, E, G. It has also C, octave lower, and B $\flat$ and C above; but the first five are the only effective notes. It is provided with two rings, to which a cord is attached for suspension to the shoulder of the bugler. See BAND (MILITARY).

The *Kent bugle*, a bugle with keys to provide the additional notes (see MUSIC—*Musical Instruments*), was at one time very popular as a leading instrument in brass bands. It was, however, difficult to play, and another modification, the *valved bugle*, was introduced. Both are now entirely superseded by the Cornet (q.v.) as a leading instrument, except in the purely bugle-bands of some of the rifle regiments. A valved attachment to fit on to the ordinary bugle, to enable it to be used as a band instrument, has also been invented, but little use has been made of it.

Bugle sounds or *calls*, as the military signals are called, are all written within the compass of the five principal notes of the bugle. They vary in character from a single note G, meaning 'right' (two Gs being 'centre,' and three 'left'), to the infantry 'veille,' or morning call, which may be said to have some pretensions to being a musical composition, as it has five movements, a largo, allegretto, vivace, adagio, and presto. The soldiers display much ingenuity and considerable humour in adapting words to many of the calls. We append a few of the 'sounds' as specimens:



Bugle is a name for a slender, elongated kind of Bead (q.v.), usually black.

Bugloss, a name popularly applied to many plants of the natural order Boraginæ (q.v.), more strictly to *Anchusa* (*Lycopsis*) *arvensis*, a common weed in cornfields in Britain. See ALKANET. The beautiful *Echium vulgare*, of the same order, bears the English name of Viper's Bugloss. Both these plants are naturalised in the United States.

Bugulma, a town in the Russian government of Samara, on the Bugulinka, a tributary of the Kama; pop. 13,000.

Buguruslan, a town in the Russian government of Samara, on the Kinel, in the great Volga steppe, with 20,000 inhabitants.

Buhl or Boule Work, the name applied to a sort of inlaying of brass scrolls and other ornamental patterns in wood. The name is derived from its inventor, Charles André Boule, less correctly Boule (1642–1732), a cabinetmaker in the service of Louis XIV. He employed veneers of dark-coloured tortoise-shell, inlaid with brass. Cabinets of his manufacture are highly prized, as are also those of his contemporary Reisner, a German, who used a ground of tulip-wood, inlaid with flowers, &c. in darker woods, and varied with margins and bands of light wood, with the grain crossed for contrast. This modification of buhl-work is correctly called

Reisner work. For a detailed account of the methods of working, see INLAYING, and MOSAIC.

Buhrstone, a variety of Quartz (q.v.), containing many small empty cells, which give it a peculiar roughness of surface, particularly adapting it for millstones. The name is given without reference to geological relations, but it is *vein quartz*, rather than true *quartz rock*, which ordinarily assumes the character of buhrstone. There are different varieties of buhrstone, some of which are more compact, or have smaller cells than others; and those in which the cells are small and very regularly distributed, about equal in diameter to the spaces between them, the stone being also as hard as rock-crystal, are most esteemed. Good buhrstone is found at Conway in Wales, and at several places in Scotland, as well as near Cologne in Germany. Buhrstones are quarried in New York, Pennsylvania, and North Carolina. But the finest millstones are obtained from the quarries of La Ferté-sous-Jouarre, in the department of Seine-et-Marne, near Paris. It is not unusual to form millstones of pieces of buhrstone cut into parallelepipeds, or other suitable shapes, and bound together by iron hoops. The stone is found in beds or in detached masses, and the mode of quarrying is peculiar. When the mass is large, it is cut out

into the form of a huge cylinder; around this grooves are cut, at distances of about 18 inches, the intended thickness of the millstones; into these grooves wooden wedges are driven, and water is thrown upon the wedges, which, causing the wood to swell, splits the cylinder into the slices required. —Millstones are sometimes made of siliceous grit-stones, of sandstone, and even of granite (see MILL). Buhrstone millstones are extremely durable.

Building. The walls of a house may be of concrete, wood, stone, brick, brick and timber, iron, mud, turf, and even snow. In the arctic regions a house with snow walls is felt to be fairly comfortable. In the tropics a strong tent constructed of posts and palm-leaves suffices for an abode. The following tradesmen take part in the erection of an ordinary dwelling-house: mason or bricklayer, marble-cutter, carpenter, joiner, slater, plasterer, glazier, smith or founder, plumber, gas-fitter, painter, and bell-hanger.

Site and Foundation.—If there is a choice of site, one should be chosen with a dry subsoil and good natural drainage. Where ground has been made up artificially, it should either be carefully avoided, or the tracks for the foundation courses of the walls must be sunk till they reach the natural stratum of earth or surface of rock. In certain situations, as where the ground is marshy, wooden Piles (q.v.) are used to carry walls. However dry the ground may be, a 'damp-proof course' should be formed a little above the level of the ground by levelling the walls and spreading a thin layer of asphalt over them, or by laying a course of glazed pottery slabs. The damp-proof course should be below the lowest flooring-joists. See FOUNDATION, and ASPHALT.

Walls.—For buildings such as churches and houses in most civilised countries, walls are nearly always constructed of brick or stone. But in Norway, Sweden, Russia, and Switzerland, as well as in parts of Asia and America, many houses, and in some cases churches, are erected entirely of wood (see CHALET). Another way of constructing walls has been adopted largely in Europe, and to some extent in America. This consists of a concrete formed of sand, pebbles, broken stone, and lime mixed with water. It is a revival of an ancient Roman method, and, on the Continent especially, has produced satisfactory results. Steel concrete or reinforced concrete—the concrete, very deficient in tensile strength, being 'reinforced' with a network of steel rods—is now largely used for walls, floors, and partitions. Stone walls for ordinary houses are usually built 2 feet thick, but they are often made much thicker in the case of large public buildings. Their Masonry (q.v.) is either of Ashlar (q.v.) work or of Rubble (q.v.), jointed with mortar, which is also used for brick-work (see CEMENTS). The external brick walls of some houses are only 9 inches thick, but they should be at least 14 inches thick, especially if the building is two stories or more in height. They are often built hollow—i.e. with hollow spaces formed in their thickness—which tends to keep down damp (see BRICKLAYING).

Partitions.—On the ground-floor, and wherever strength of construction is required, these are best formed of brick, usually 4½ inches, occasionally 6, and sometimes 9 inches thick. They are now occasionally built of hollow bricks. Wooden partitions are formed of upright quarterings or studs, called in Scotland standards, 4½ by 2 inches, and from 12 to 14 inches apart, and covered with lath to receive plaster. In Great Britain these timber partitions are left hollow, but in Paris the quarterings are nailed over horizontally with strong oak laths a few inches apart, and all the interspaces filled in with

stone rubble. A plaster of Paris mortar is then pressed through the rubble, leaving as much body on the surfaces as will cover and imbed all the timber, and in this way form a solid partition.

Flooring.—The lowest floor, if formed of wood, should be above the level of the ground, should have a space below the joists, and air should be admitted by openings through the walls for ventilation. If this is not done, the timber is apt to be attacked by dry-rot, caused by a species of fungus. Floors near the level of the ground, when laid with flagstones, asphalt, or cement, require a six-inch layer of broken stones, covered with a bed of mortar or cement below them. All the floors of a house, except in some apartments of the lowest story, are usually formed of wood; but if they are of large size, the joists are often supported by iron beams (see GIRDER). Floors whose under sides form ceilings of rooms below them require to be 'deafened' with a layer of some mixture such as coarse plaster, mortar, and chopped straw, or of ashes and lime, under the flooring-boards. In large or important buildings floors are often constructed of either solid or hollow brick arches thrown between iron beams, in which case they are fireproof. See FLOOR.

Roofing.—For large spans iron roofs are a feature of the age, and the French have been particularly successful in the artistic treatment of this material; but wooden roofs are commonly put on ordinary houses. Where it is available, Slate (q.v.) is for the most part used to cover sloping roofs, but occasionally thin flagstone takes the place of slate. Tiles of red, blue, and other colours are now sometimes chosen, even for the roofs of public buildings, in preference to slate when colour effect is sought after. Flat roofs are covered with lead or zinc, the former being the more durable. The gutters, flushings, and generally the ridges of roofs, are of lead; but they are frequently made of zinc, which does not last long in large towns, although it is more durable in the country. Thatch, felt, Asphalt (q.v.), and wooden Shingles (q.v.) are all used to cover roofs; and glass is largely used in roofs of railway stations, exhibitions, and the like.

Joiner-work.—Doors, windows, shutters, and generally what are called the internal finishings of a house, are made and fitted up by the joiner.

Information on other points of interest will be found in the articles on Fire, Electric Light, Gas-lighting, Timber, Ventilation, Warming, and Water-supply, besides those already referred to.

Plaster-work.—The covering of the internal surface of walls, and the surface of partitions and ceilings with plaster, as well as the construction of the cornices and other modelled decorations of rooms in plaster of Paris, is done by the plasterer. The inside of external stone and solid brick walls should be strapped and lathed before being plastered, otherwise it is difficult to keep the plaster dry.

Plumber-work.—Much of the comfort of a house depends upon the efficiency with which the plumber does his work. The lead water-pipes should be placed in situations protected from frost, and they should be of a sufficient thickness to stand the required pressure. Lead piping is not very suitable for the conveyance of hot water (see LEAD). Easy access should be given to water-cisterns, in order that they may be frequently cleaned. All the fittings of cisterns, baths, and water-closets, and soldered joints everywhere, require the utmost care and attention. A very small hole, through which an almost invisible drop of water can escape, will often cause much damage before it is detected. The lead and zinc work of roofing noticed above is done by the plumber. Zinc baths are not so common as they were, enamelled iron ones being

preferred to them; but those made of strong earthenware, with a white glaze, are perhaps the best of all, as a glaze on burnt clay does not chip like an enamel on metal. Excellent kitchen-sinks are also made of glazed earthenware, but those formed of lead on a wood framing have also advantages, and have been longer in use. Such questions as the non-desirability of having fixed wash-hand basins in bedrooms, and the trapping of pipes which enter drains, will be treated of under the head SEWAGE.

Gas-fitting.—The gas-pipes of a house should be of tin, as it is harder and stands much better than the cheap composition tubing, made of a mixture of lead with other metals, now so much used. Unless they are formed of iron, gas-pipes should be placed in protected channels, and not exposed on the surface of walls. Leaks in tin or other more or less soft-metal pipes are frequently caused by the carelessness of joiners driving nails through them. It occasionally happens that rats gnaw through these kinds of pipes when they are in their way, and they more frequently destroy lead water-pipes in the same manner. In order to be sure that the gas-pipes in a house are perfectly airtight, they should be tested with a force-pump and an indicator.

Glazing.—Windows of houses are most commonly glazed with sheet-glass varying in weight from 15 to 26 ounces per superficial foot. Thicker kinds are made for very large-sized panes. When plate-glass is used, it is generally about one-fourth of an inch thick. In some shop windows it is considerably thicker. Few persons, except those who have much experience in the matter are aware how great is the difference in the qualities of plate-glass. Some kinds will keep clean six times as long as others under precisely the same circumstances. The qualities of sheet-glass also differ considerably, but it is much more easy to select good glass of this kind. See GLASS.

Painting and Papering.—The painting or papering of plastered walls should not be attempted till they are thoroughly dry. Paint greatly helps to preserve external wood-work, and it is equally necessary to frequently renew the painting of light railings or balcony panels, if they are made of malleable iron. Inside work, such as doors, shutters, architraves, window-breasts, and walls (if not papered), should get at least four coats of oil-paint. Frequently these finishings receive three coats of varnish instead of paint, if it is desired to show the grain of the wood. It is often the case that a first coat of glue-size is substituted for one of varnish, which makes an inferior job.

Building Materials.—Building stone, brick, terracotta, cement, and concrete are noticed under their respective heads. In the better class of houses the roof timbers, joists, window-frames, and other external wood-work are made of what is known in commerce as Baltic redwood, which is imported from Danzig, Riga, Petrograd, and other places on the Baltic. It is the product of the Scots pine (*Pinus sylvestris*). This wood when grown in Great Britain is not so valuable for building purposes as the imported timber. It is a moderately heavy, resinous, durable, and easily worked wood (see PINE). For room-doors, shutters, dados, and other internal work, the wood of the American yellow pine (*Pinus mitis*) is very generally used. It is an excellent timber for these purposes. Californian redwood (*Sequoia sempervirens*) is now, to some extent, used in Great Britain for the same kind of work as yellow pine. The pitch pine (*Pinus rigida*) of the United States yields a very resinous wood with a showy grain, which has also been occasionally employed for the joiner-work of houses in England.

An inferior wood, imported from Danzig, called whitewood, and said to be obtained from a species of spruce, has of late years been largely used for joists and roofing, owing to the comparatively high price of Baltic redwood. This whitewood is also, to some extent, employed for the internal finishings of rooms. Oak, mahogany, and other hard woods are only in request for parts of exceptionally important and costly buildings.

Machine-work.—Machinery is now extensively employed for sawing and cutting ordinary limestone and sandstone, as well as granite and marble (see article STONE). The sawing, planing, moulding, mortising, tenoning, dovetailing, and turning of wood is likewise executed on a large scale by machine tools. Sash and door clamping machines are also in use, so that in the workshops of many large builders hand-work on doors, window-sashes, and frames is reduced to a minimum.

See the South Kensington *Notes on Building Construction* (1872) and *Advanced Building Construction* (1892); Kidder, *Building Construction* (N.Y. 1898); Pite and others, *Building Construction* (1911); Gourlay, *The Construction of a House* (1911); and books named at CONCRETE.

Building Leases. Under a variety of statutes in England and Scotland, the crown, represented by the Commissioners of Woods and Forests, heirs of entail under strict settlement, the Ecclesiastical Commissioners, the great university corporations, mortgagees in England, are authorised to grant building leases for ninety-nine years. The term of ninety-nine years has thus come to be associated with building leases, but such leases are granted for various periods. In England it has been decided that municipal corporations cannot at common law grant building leases for more than seventy-five years. In the case of the Montgomery Act, passed for Scotland in 1770, very stringent conditions were laid down as to the number of houses and the extent of ground, but these have been practically superseded by later legislation. It is much questioned whether the building lease is a convenient and economical tenure in towns. In the United States, building leases include repairing leases, and may continue for any term of years agreed upon by the parties, no time being specified by State or United States law. See GROUND-RENT, LEASE, and LEASEHOLD.

Building Societies in the United Kingdom were formerly regulated by an act passed in 1836. This act (the Benefit Building Societies Act) empowered such societies to raise a fund by periodical subscriptions for the purpose of enabling the members to erect and purchase dwelling-houses, or acquire other real or leasehold estate, to be mortgaged to the society until the amount or value of the shares drawn on should be fully repaid with interest and all other appropriate payments. A share was not to exceed in value £150, and the corresponding monthly subscription was not to be more than twenty shillings. A majority of the members might make rules and regulations for the government and guidance of the society, such rules not being repugnant to the provisions of the act or to the general laws of the realm. No member was to be allowed to receive any interest or dividend on his share until the same had been realised, except on the withdrawal of such member according to the rules of the society.

After an elaborate inquiry by Royal Commission, with which the name of Sir Stafford Northcote (Lord Iddesleigh) is connected, the Building Societies Act was passed in 1874, and amended in 1875, 1877, 1884, 1894. Regulations are issued from time to time by the Home Secretary, and the Court of Session framed an act of sederunt regulating the liquidation proceedings of Scottish societies

in the Sheriff Court. The Act of 1874 enlarged and modified the scope and powers of building societies. Societies already in existence were given the option of becoming incorporated under the Act of 1874 or of remaining unincorporated and continuing under the old laws superseded by that act; all societies established after 1874 *must* be incorporated and be bound by the new legislation. Non-incorporated societies are termed 'Benefit Building Societies.' A distinction is also drawn between permanent societies and terminating societies 'which by their rules terminate at a fixed date or when a result specified in the rules is attained.' Section 13 declares that any number of persons may establish a society, either terminating or permanent, for the purpose of raising, by the subscriptions of the members, a stock or fund for making advances to members out of the funds of the society, upon security of freehold, copyhold, or leasehold estate, by way of mortgage; and any society under the act may from time to time raise funds by the issue of shares of one or more denominations, either paid up in full or to be paid by periodical or other subscriptions, and with or without accumulating interest, and may repay such funds when no longer required for the purposes of the society. It will be seen that the restrictions of £150 and twenty shillings have disappeared, the contributions and ultimate value of a member's interest being at his own discretion. The liability of members, in respect of shares upon which no advance has been made, is limited to the amount actually paid or in arrear thereon; and in respect of shares upon which advances have been made, is limited to the amount payable under any mortgage or other security, or under the rules. Societies are empowered to receive deposits or loans, from members or other persons, corporate bodies, joint-stock companies, or terminating building societies, provided, in the case of permanent societies, that the total amount owing at one time shall not exceed two-thirds of the amount for the time being secured to a society by mortgages from its members; and in the case of terminating societies, shall not exceed two-thirds as aforesaid, or a sum not exceeding twelve months' subscriptions on the shares for the time being in force. Societies established under or adopting the Act of 1874 are bodies corporate, having perpetual succession and a common seal, thus dispensing with the cumbrous and inconvenient system of trusteeship. Their rules must specify the society's name and place of meeting; mode of raising funds, with their purposes and mode of investment; terms of withdrawal and repayment; manner of alteration of rules; the appointment, remuneration, and removal of officers; provisions as to general and special meetings, and the settlement of disputes, custody of seal, mortgage deeds, and securities, powers of directors and other officers, fines, and mode of dissolution. Societies may unite with others, or one society may transfer its engagements to another. They may purchase, build, hire, or take on lease any building for conducting their business. Minors may be members, but cannot vote or hold office during nonage. Accounts are to be furnished to members and loan depositors annually. The societies are exempt from stamp-duties of every kind, except those upon mortgages. The failure of the Liberator Society (incorporated under the Act of 1874), with total liabilities to depositors and shareholders amounting to over £3,300,000, nearly the whole of which was a total loss, occurred in 1892. The failure was caused by speculations outwith the proper sphere of a building society, and resulted in a loss of confidence in all such societies. A consequent run on the Birkbeck Society by depositors caused the withdrawal of

£1,578,000 within a few days. An inquiry by the government was followed by the passing of the Act of 1894. Under it all the societies established after 1856, but still remaining under the Act of 1836, were bound to be incorporated under the Act of 1874. The act prohibits in future societies the balloting for advances, and provides a method whereby the balloting in certain existing societies may be abandoned. The Registrar may, on the application of ten members, appoint an inspection of the books of any society, and on the application of a tenth of the whole members, cause an investigation as to whether the society should be wound up. Other points put on a more definite footing than previously are the raising of stock, the terms of advances and their repayment, unadvanced subscription shares, withdrawals, paid-up and preferential shares, the borrowing of money, the ascertaining and providing for losses.

The compulsory winding-up in 1911 of the two Birkbeck societies (established 1851-52) greatly diminished the importance of unincorporated societies, and checked the steady recovery in membership which English building societies had maintained since 1901. The original Birkbeck Society since 1871 had enormously developed its banking business, while its purely building business remained almost stationary; in 1910, out of 11 millions sterling due to depositors, only £750,000 was on mortgage securities, the remainder being represented by investments in miscellaneous securities and cash. Depreciation of securities led to the suspension of the Birkbeck Bank. The Court of Appeal decided that the extensive banking business of the society was *ultra vires* of the directors. The Registrar (who has no say in the original rules of unincorporated societies) reported in 1912 that he considered it improbable that any of the surviving unincorporated societies engage in banking business. No rules can be registered enabling an incorporated building society to carry on any other kind of business such as banking or fire insurance, to make advances to non-members, except by way of investment of surplus funds, or to acquire and permanently possess land generally.

Since 1894 the number of building societies has greatly decreased, owing mainly to the gradual working out of terminating societies, without being replaced, and the absorption of business by the bigger permanent societies. The building society movement, whose aim is to enable every man to become his own landlord, cannot but be affected by present and future attempts to solve the housing problem generally.

The Starr-Bowkett Society is one form of the terminable building society. In the original Bowkett type the subscriber lends the society a small sum annually for a very long time, say 31 years, and the society lends him a large sum for a short time, nominally without interest. In the Starr form, after a member has repaid money lent to him on property, he has to pay an increased subscription, so as to make the society terminate sooner. The advantage of these societies depends on whether the member gets his loan early or late.

In the United States, 'building and loan associations' are private corporations giving a safe means of accumulating savings and securing loans at reasonable rates for building homes, and include organisations such as mutual loan associations, homestead aid associations, co-operative banks, and building societies. Borrowers wishing an advance take shares to the value of the loan required, and often a premium has to be paid in addition. A mortgage on the property forms the security. The first association was organised in Philadelphia in 1831. They are most common in Pennsylvania and Ohio.

See the four reports of Royal Commission on Building Societies from 1871 to 1874, with the local reports of assistant-commissioners; annual reports of the Registrar of Building Societies, and works by Scratchley and Brabrooke, Wurtzburg, Starr, Dexter, Thompson, &c.

Building Stone. No artificial building material such as brick, terra-cotta, or cement can give dignity and beauty to an edifice in anything like the same degree as an ordinary limestone or sandstone which can be cut by a chisel. Much less can burnt clay or artificial stone, no matter how much it is enriched by ornament and colour, approach marble, granite, or porphyry in giving a noble character to an architectural monument. By far the most common kinds of building stone are sandstones and limestones. The term freestone is applied indifferently to such examples of both kinds as dress freely with masons' tools. Both are bedded or sedimentary rocks, and both as a rule, when cut up into blocks for building, should be laid on their natural beds. See also **STONE**.

Sandstone.—Rock of this kind suitable for building is found plentifully in some parts of England, but principally in the central and northern counties, though it also occurs in Devonshire and Monmouthshire. Among numerous quarries it will suffice to name Darley Dale and Bakewell Edge in Derbyshire, Longridge Fell in Lancashire, Viney Hill in Gloucestershire, Bidston Hill in Cheshire, Addingly in Yorkshire, and Hadley in Worcestershire. There are several well-known quarries about Newcastle-on-Tyne, and sandstone of a pleasing red colour occurs at Penrith and other places in Cumberland. These English sandstones are obtained from the Devonian, the Carboniferous, the Permian, and the New Red Sandstone formations. It is from the 'millstone grit' division of the Carboniferous that the stone for many of the public buildings in Manchester, Bradford, and Leeds was obtained. So far as can be judged from the appearance of comparatively modern edifices, the stone stands the smoky atmosphere of these towns very well. Ancient buildings in England, however, do not on the whole show that any sandstone used in them resists decay for centuries. Durham and Chester cathedrals and numerous small churches furnish examples of this.

All the towns of any size in Scotland, except Aberdeen and one or two small places, such as Dalbeattie in Galloway, are built of sandstone. So are almost all the ancient buildings of any note. The stone is chiefly obtained from the Carboniferous and Old Red Sandstone formations, but the Permian rocks of Cumberland being prolonged into the county of Dumfries, some fine red sandstone is got there from that formation. In Scotland, accordingly, there is ample means of judging of the durability of this building material, which is on the whole so suitable for architectural purposes. It is vexatious in the extreme to have to say that much of the beautiful carved work at Kirkwall, Holyrood, Melrose, Kelso, and Jedburgh is quite wasted by decay. The age of the oldest of these abbeys is but little more than 700 years. Many modern buildings likewise show that, even when believed to be carefully selected, this material is often not durable.

So far as is known, the sandstone from Craigleith Quarry, near Edinburgh, resists atmospheric agencies better than any other in Scotland, or perhaps in the British Islands. A great part of the New Town of Edinburgh has been built of it. More recently, Binny Quarry in Linlithgowshire, the stone from which stands next in quality to Craigleith, has supplied the material for the principal buildings erected in the Scottish metropolis, and to some extent also for buildings in Glasgow; but for some years, owing to the unfavourable

state of the quarry, it has yielded only a trifling supply. The cost of working Craigleith is double that of any other Scottish sandstone that would do for a fine building, and consequently no architect has for many years ventured to use it. Binny stone can only be got with difficulty. There are, however, plenty more quarries all through the length and breadth of Scotland, except in the north-west. Strange to say, not one of them, especially in the central part of the country, can furnish a stone upon which an architect can rely as being certainly durable. Yet so strong is the desire to have ornament for merely present appearance, that large quantities of building stones are now being brought from great distances both to Glasgow and Edinburgh, simply because they are of fairly uniform colour and can be cheaply worked.

Sandstones, being composed of grains of quartz, are highly siliceous. Darley Dale contains 96 per cent., Craigleith 97 per cent., and Binny 92 per cent. of silica. Some, however, have not more than 80 per cent. of this substance. The other substances they contain are chiefly carbonate of lime, alumina, and oxide of iron. It is hardly possible to tell a good sandstone merely by chemical analysis. A hard non-porous stone is, of course, more likely to be lasting than one which is soft and porous. There are a number of ancient buildings on or near the banks of the Rhine, between Basel and Cologne, which show the durability of a sandstone in a northern climate better than any in Great Britain. In these it is of a hard nature. See **SANDSTONE**.

Limestone.—Marble and chalk are the purest limestones, but it will be convenient to notice first those more or less composite limestones which are sufficiently hard and strong for building, yet not highly crystalline like marble. One of the best-known kinds of English building stone is the dolomite, or magnesian limestone of the Permian formation, which ranges from Nottingham to Tyne-mouth. It is a double carbonate of lime and magnesia, containing a varying proportion of silica. At Mansfield in Nottinghamshire, the amount of silica is exceptionally high—viz. 50 per cent., while at Bolsover and Mansfield Woodhouse it is only 4 per cent. The Houses of Parliament are built of this dolomite, which unfortunately decays rapidly under the influence of the London atmosphere. Among ancient buildings, some parts of York Minster show its perishable nature. Yet in Conisborough Castle, built in the 12th century, and in some country churches nearly as old, it has stood the effects of time very well.

The limestone of the oolitic formation, which extends from Dorsetshire into Yorkshire, is obtained for building purposes, for which it is extensively used, at several well-known quarries, such as those of the Isle of Portland, Bath, and Leckhampton Hill in Gloucestershire, Barnac in Northamptonshire, and Ancaster in Lincolnshire. The Bath stone contains 95 per cent. of carbonate of lime; and the Portland stone, which, though belonging to the same formation, is not of oolitic structure, contains the same percentage of that carbonate. The former has besides $2\frac{1}{2}$ per cent. of carbonate of magnesia; the latter 1·2 per cent. of this substance, and the same amount of silica. Small quantities of alumina, iron, and water are present in both. Much of the oolitic limestone is easily cut with a saw when newly quarried, but it hardens on exposure, and is fairly durable. Like the dolomite above mentioned, it is very suitable for enriched as well as plain work, and is of a pleasing colour. Some ancient structures built of the oolitic limestone of their own neighbourhood are in a good state of preservation. Among these

are Lincoln Cathedral, some churches at Oxford, and Wells Cathedral. There are others, however, which have not so well resisted decay. St Paul's Cathedral, London, is built of Portland stone. Kentish rag is an impure limestone, compact, heavy, non-absorptive, and difficult to dress. It is used in London chiefly for rubble work, and is very durable.

There are extensive deposits of limestone in England, Scotland, and Ireland, which are only fit for burning into lime, or at least are not suitable for the hewn work of buildings.

The fine limestone from Caen in Normandy is much used for internal architectural work in England, and to some extent even in America. It is a fine-grained, easily chiselled, beautiful material, of a creamy-yellow uniform colour. But in external work it is very liable to decay, especially in towns. In the middle ages it was employed for some cathedrals—that of Canterbury, for example—as well as for smaller churches in the south of England. Travertine is a peculiar kind of limestone believed to be formed by precipitation from water containing lime. It is somewhat cellular in structure, of a buff colour, and very durable in Italy, where, in Rome especially, it has been extensively employed for both ancient and modern buildings, among others the Colosseum and St Peter's. Nummullite limestone is chiefly composed of beautiful fossils like coins or buttons of filigree work. Some of the Egyptian pyramids are built of this stone. See NUMMULITE.

Marble.—In the British Islands marble is only used for the decorative parts of buildings. White marble is found in Skye, Sutherland, and one or two other places in Scotland. It also occurs in a few localities in Ireland; but it is doubtful whether it would be profitable to work it in either country. Coloured marbles, some of which are handsome, are regularly quarried in Devonshire, and also in Derbyshire, where they contain shells, encrinites, and other fossils, which give them an attractive appearance when polished. Ireland is comparatively rich in coloured marbles. The wavy and mottled green serpentinous marble of Connemara is a very beautiful stone. Black marble is worked in Kilkenny and other counties, and a veined red marble in Cork. Italian and other foreign marbles are, however, more used in the United Kingdom than the native kinds. See MARBLE.

Serpentine.—This has a general resemblance to coloured marble, but it is of quite different composition, being a silicate of magnesia. Cornish serpentine is perhaps the most beautiful ornamental stone in the British Islands. It is principally used for internal decoration. Serpentine is found in Banffshire and in Shetland, but only pieces of limited size can be got. See SERPENTINE.

Granite.—In the granite districts of Great Britain, the stone is used for ordinary building purposes. Aberdeen, for example, is almost wholly built of this material. It is usually only hammer-dressed, but even with the rough face so imparted, it gives a building a good appearance. For decorative purposes it is polished. Peterhead and Ross of Mull are red granites, while the Aberdeen, Dalbeattie, and Cretown varieties are gray or bluish gray. Peterhead granite especially is a good deal used in London and other large towns in the British Islands for some of the more prominent features of buildings, and is also sent to America. The Cornish granites have been much employed for bridges over the Thames, and for docks and breakwaters. There are some good granites in Ireland. See GRANITE, and SYENITE.

United States.—Many excellent building stones are found in America. The quarries of Maine have

been the chief source of the supply of granites; and of those from this state the Calais variety is red, and that from Spruce Head gray, both of these taking a fine polish. The granite from Hallowell, also in Maine, is remarkable, as its dressed surfaces are nearly as white as marble. New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, and several other states contain granite. Sandstones constitute the most valuable group of building stones in the United States, as they have a wide distribution, have much diversity of tint and texture, and can be comparatively cheaply obtained. They are principally of triassic and carboniferous age. White marble has been quarried on a considerable scale for important public buildings. That from Lee, Massachusetts, which is strong and durable, was used in the construction of the Capitol at Washington, and for the city hall at Philadelphia. From Stockbridge, in the same state, the marble was got for the state-house at Boston and the city hall of New York. Tuckahoe marble, which is pure white, strong, and coarse-grained, has been employed for some of the finest buildings in New York. For St Patrick's Cathedral a pure white dolomite called 'snowflake marble,' from Pleasantville, New York, has been chiefly used. Rutland county, Vermont, is the great centre of the marble industry for purely decorative purposes. Numerous beautiful coloured marbles have been discovered in the United States.

Stone-dressing.—Ashlar stones (see MASONRY), whether of limestone or sandstone, after being chiselled on the face, generally get the tool-marks removed by smoothing them with a bit of soft sandstone and water. In England a stone so finished is technically said to be *rubbed*; in Scotland, *polished*. It has, however, become the custom in Scotland, where sandstone is the only freestone, to dispense with the 'polishing' and leave irregular chisel-marks visible. In former years there were in use various effective ways of dressing stones for the fronts of buildings. One of these was *tooling* or *droving*—i.e. covering the face with small flutings by means of a broad chisel; another was *broaching* or incising the face with narrow parallel grooves by the use of a pointed tool. Many buildings of a by no means unpretentious kind recently erected in Scotland and elsewhere have their ashlar stones dressed only on their beds and joints, their faces being merely 'pinched' from the edges, leaving the exposed part of the stones rough and hackly. When the face of granite is not polished it is generally dressed with a nidding hammer, which gives it a chiselled appearance.

Preservation of Stone.—The preservation of stone can be effected to a great extent by coating the surface with boiled linseed-oil, or with oil-paint; but these methods are not much in favour, as they destroy the crystalline appearance which constitutes the beauty of most natural stones. There is, however, no other efficient way known of preserving a sandstone with a tendency to decay. More hope may be entertained that certain chemical solutions will prevent the wasting of oolitic and magnesian limestones much used as building stones in London and southern England generally. The coating of these with an alkaline silicate and the subsequent application of calcium chloride, as proposed by Ransome, has not had the beneficial result which was expected from this treatment. Another method is to use an alkaline silicate alone, leaving the carbon dioxide of the atmosphere to act. Baryta water can be applied to crumbling limestone. Bath stone (oolitic) and other building materials have been treated with a silicious preserving solution under the name of 'Fluate.' The

preservation from decay of a porous substance like freestone (whether sandstone or limestone) in a climate like that of northern Europe is a problem of the greatest difficulty. One precaution ought never to be neglected, and that is to see that a 'damp-proof course' is put through the walls of a building just above the ground, to prevent the ascent of moisture from the soil. See BUILDING.

Artificial Stone.—Burnt clay in the form of bricks or terra-cotta blocks of larger size, though not usually classed as artificial stone, is by far the best substitute for real stone. Portland Cement (q.v.), mixed either with sand alone or with sand and broken stones, forms one kind of artificial stone (see CONCRETE). In the north of Italy paving tiles with beautiful patterns are made by inlaying Portland cement with small pieces of marble, serpentine, and other ornamental stones. This kind of work is obviously suited for external wall decoration of a very effective kind, provided that even the best Portland cement has the durability which some of its advocates claim for it. Scagliola (q.v.) is a polished plaster for internal decoration, somewhat similarly ornamented. Von Fuchs of Munich, Kuhlmann of Lille, and Ransome of Ipswich have successively done material service in enabling an artificial stone to be made of the silicate of soda or potash (soluble glass or water-glass) and sand (see GLASS). Ransome's artificial stone is a hard substance formed by mixing sand with a solution of this alkaline silicate, then pressing it into moulds, and when partially dry soaking it in a bath of chloride of calcium, which to some extent penetrates the 'stone,' forming the insoluble silicate of lime (calcium silicate). Chimney-pieces, vases, and architectural ornaments of various kinds have been made of this material. Ransome's 'patent concrete stone' is made in the same way, with broken pieces of stone added.

Buitenzorg, capital of a sub-residency in Java, 35 miles S. of Batavia by rail, stands in mountainous country, 880 feet above the sea, and has so fine a climate that it is becoming more and more a favourite summer resort of the Batavian merchants. The splendid country palace of the governor-general is here, and around it an extensive and famous botanic garden. Pop. 34,000.

Bujalan'ce, a city of Andalusia, Spain, 25 miles E. of Cordova. It has an old Moorish castle, and manufactures of leather and woollen cloth. Pop. 10,000.

Bukarest, Bukharest. See BUCHAREST.

Bukkum Wood. See BRAZIL-WOOD and SAPPAN-WOOD.

Bukkur, a fortified island of the Indus, in Sind, between the towns of Rohri and Sukkur. Composed of limestone, it is 800 yards long and 300 broad, and rises 35 feet above the stream. The great Lansdowne cantilever railway bridge (completed 1889) across the Indus here, which is 1200 feet long, takes advantage of the island.

Bukovina ('beech-land'), a former crown-land of north-eastern Austria, now mainly Rumanian, though much of it is claimed by Ukraine. It is traversed by offshoots of the Carpathians, culminating at 6077 feet; gives rise to many rivers flowing towards the Black Sea; and abounds in wood, along with considerable mineral riches. Large numbers of cattle are reared, and also excellent horses. The Bukovina, according to many Austrian historians, was wrested from Transylvania in 1482 by Moldavia; but it had long before formed an integral portion of the latter state, whose fortunes it shared till, in 1775, it was ceded by the

Turks to Austria. For a time it was united to Galicia, but in 1849 was made a separate 'crown-land,' or province, and was officially still a duchy. In the Great European War it was the scene of much fighting between the Russians and Rumanians and the Austrians and Germans. In November 1918 it was united with Rumania. Austria thus lost an area of 4000 square miles, with some 800,000 inhabitants. Of these about two-fifths were said to be Ruthenians, over a third Rumanians, one-fifth Germans. Most of the inhabitants are of the Greek Church. Czernowitz (Cernauti) is the capital.

Bulacan, a town of Luzon, Philippines, at the head of the bay of Manila, and 20 miles NW. of the city of that name; pop. 15,000.

Bulandshahr, a British district in the Meerut division, United Provinces of India, with an area of 1900 sq. m., lying between the Jumna and the Ganges. It forms a part of the Doab, and presents the aspect of a monotonous cultivated plain, with an average elevation of 650 feet above sea-level. The Ganges Canal passes through the district from north to south, and artificial irrigation has made many unpromising areas fruitful. More than one-fourth of the cultivated area is so supplied. Cereals, safflower, indigo, cotton, and wool are exported. The East India Railway passes through Bulandshahr, the Oudh and Rohilkhand Railway crosses its south-east corner. The most important towns are Khurja, Sikandarabad, and Bulandshahr or Baran. This last, the administrative headquarters, is a place of great antiquity, coins of Alexander the Great being still found there. Pop. of town, 20,000; of district, 1,124,000.

Bûlâq, or BOULAK, the port of Cairo, on the Nile, opposite an island of the same name, is now a mere suburb. Here was formed by Mariotte Pasha the national museum of Egyptian antiquities, removed in 1889 to Gizeh, and now in Cairo.

Bulawayo, or BULUWAYO, chief commercial town (but not capital) of Southern Rhodesia, 400 miles W. of Beira, is connected by rail with Capetown, Beira, and Katanga, and is the seat of the Rhodesian Museum; white pop. 5000.

Bulb. Our perennial herbs which die down during the winter have always accumulated during the summer some store of reserve material (starch and nitrogenous matters) which serves as capital upon which to draw for their new and rapid start in spring. This subterranean store may be deposited in roots

(e.g. orchis), in an underground creeping stem (e.g. rhizome of iris or primrose), in definite portions of rhizome which are then called *tubers* (e.g. potato, Jerusalem artichoke), or in the lower portion of the main axis (*corm* of crocus), which thus assumes a bulbous form (see ROOT, RHIZOME, TUBER, CORM). The term bulb is, however, restricted by botanists to those cases in which the store is deposited in the leaf-bases, or in modifications of entire leaves. The incipient bulb is best seen in the common wood-garlic (*Allium ursinum*), in which the store is deposited in the swollen spindle-shaped base of a



Fig. 1.—Bulb of *Allium ursinum*: a, side view; b, front view; c, section.

foliage leaf (fig. 1). The first leaf of the following year's growth is not swollen, but almost completely insheathes the developing flower axis, the first foliage leaf of which again thickens as the bulb, and develops in its axil the bud of next year. From such a simple form transitions in all directions are easy: thus if we increase the number of leaves, and unite without greatly thickening their sheathing bases, we have the incipient bulb of the leek. Here the store is deposited along an indefinite extent of leaf-base, which the gardener accordingly artificially extends by hoeing up earth around the plant, and so arresting vegetation in the blanched portion, and giving us the succulent parenchymatous esculent which is so familiar in cookery. In the onion or hyacinth, however, the area of storage becomes clearly marked off, and in autumn the vegetative portion of the leaf dies away, leaving the successive leaf-bases overlapping each other around the

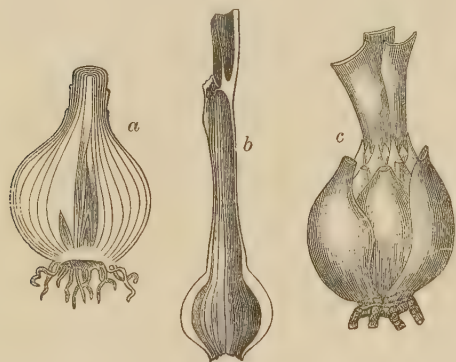


Fig. 2.

a, Tunicated bulb of onion; b, onion leaf dissected off; c, bulb of *Lilium candidum*, showing a reduction of leaves towards scaly bulb.

excessively shortened disc-like axis. This is the so-called tunicated bulb (fig. 2).

In almost all forms of this, one or more of the lowermost leaves of the axis cease to appear above ground; and in some cases (e.g. *Lilium candidum*) where the bulb is made up of more than one year's growth, it is composed of first the thickened leaf-bases of a previous year; next the short, thick, scaly leaves of the lower portion of the axis; and within this the swollen leaf-bases of the upper portion (fig. 2, c). This leads to the case presented by other lilies (e.g. *L. martagon* and *bulbiferum*) in which the foliage leaves are restricted to the upper portion of the axis, and the leaves of successive years forming the bulb are all subterranean and reduced to swollen overlapping scales. This is the so-called scaly bulb.

In some cases many new daughter-bulbs may develop in the axils of the leaves composing the parent bulb; such are the so-called cloves of garlic (*Allium sativum*). Tunicated bulbs are hence sometimes propagated by cutting across transversely; a series of axillary buds is thus compelled to arise. In *Lilium bulbiferum* the same principle appears, and in its simplest form; for the buds in the axils of the foliage leaves are developed as small bulbs (bulbils), and these readily fall off and take root. In other species (*A. Schenoprasum*, *A. fallax*), we find incipient cases of bud formation along a rhizome; and this becomes strongly marked in the common *Saxifraga granulata*, of which the crowded bulbs are not unfrequently mistaken for mere tuberous swellings along the roots, until dissection proves that we have to do with the bulbous buds of spreading rhizomes.

The use of the bulb to the plant, as affording at once a citadel of refuge during the severity of the winter of cold climates, or of the dry season of warmer ones, and a store of materials for a vigorous start in spring before the competition of other plants has become active, will be sufficiently obvious; and the importance of bulbous plants in such peculiar climates as that of Siberia or of the Cape of Good Hope is thus readily accounted for. The large nutritive store gives a proportional possibility of reproductive outlay, and the remarkable size and beauty as well as the earliness of flowering of most bulbous plants is thus explained. For all these reasons, as well as the ease of their cultivation, preservation, and transport, they have always been greatly valued by the florist; their nutritive store in some cases makes them valuable and savoury articles of food; while others—such as that of Squills (*Scilla*, q.v.)—contain also products of vegetable waste, which have turned out to be of medicinal importance.

Bulbul, a Turkish name (used also in Persian) for the nightingale, which has found its way into English poetry through Moore's and Byron's patronage. But the same name is given in India to a very different bird, *Pycnonotus hæmorrhous*, usually ranked among the babbling thrushes (Timeliæ). It is a little bird of brilliant plumage, and the male has a crest or tuft on its head. It is remarkable for its pugnacity; the Singhalese consider it the most game of all birds. Its powers of song have also earned for it the name of 'Ceylon nightingale.' The name bulbul is also applied to related forms like the Bristle-necked Bulbuls (*Criniger*) in Western Africa, India, &c., and the Red-whiskered Bulbul (*Otocampa jocosa*) of India and Burma.

Bulgaria, in theory a constitutional monarchy, is situated south of the Danube and west of the Black Sea. Geographically, it is split up into three zones running from east to west. Of these the most northerly, contained between the Danube and the Balkan Mountains, existed from the year 1879 until October 1908 as an autonomous principality under Turkish suzerainty. The central belt lies between this chain and the mass of the Rhodopes, and was governed as an autonomous province under the name of Eastern Rumelia down to the 18th September 1885, when it was united with the principality in consequence of a revolution. The third strip has varied with the fortunes of war. The whole region extending southwards to the Ægean Sea, and comprising the hotly contested provinces of Macedonia and Thrace, together with the important ports of Salonika, Kavalla, and Dedeagatch, Bulgaria had earmarked for herself as her share of the fruits of the first Balkan war; but it was divided up among several states as a result of the second campaign, and again after the world-war. Since 1914 Bulgaria has made strenuous endeavours to have this territory redistributed in her favour.

The entire country is watered by many streams, which intersecting mountains—often forest-clad as high as 1900 feet above sea-level—keep from meeting and commingling. Alone the Isker, which takes its rise in the Rylo, flows through nearly the whole width of Bulgaria.

The climate, which is continental, differs according to the zones, and the soil, watered by streams, rains, and snow, and warmed by a fierce summer sun, produces in abundance wheat, maize, barley, tobacco of good quality at the base of the Rhodopes and in the Haskovo district. Grapes grow on the hillsides at an altitude of 500 feet above the level of the sea, and the fruits of Kustendil and the roses of Kazanlik, cultivated by the most skilful gardeners of eastern Europe, enjoy a

wide reputation. Waste, neglect, and mining requirements have stripped the country of many of the dense forests with which it once was covered. None the less, oak and beech forests still flourish in the north, the former at an altitude of 700 metres and the latter at 1300; while the south possesses considerable forests of conifers. Altogether the wooded districts of the central zone occupy no less than 30 per cent. of the entire area, and timber is one of the exports of the country.

Bulgaria's fauna differs little from that of central and southern Europe. Among the wild beasts and birds of prey may be mentioned the bear, the wolf, the jackal, the wild boar, the eagle, the falcon, and the owl.

The fertility of the soil, taken in conjunction with the Spartan frugality of the people, is deemed adequate to support a population from four to five times greater than the number of its present inhabitants, which is nearly 5,000,000. Large estates have ceased to exist since the departure of the Turks, who, after the war of 1878, sold their possessions for what they would fetch to village communities, which divided them into lots among their own members. To-day the land is cut up into small holdings, mostly of from two and a half to five acres. The proprietors are chiefly peasants. Under these conditions the methods of cultivation are primitive, and the soil, which is generally very fertile, is but superficially ploughed. As a considerable percentage of the soil not yet under cultivation is capable of being tilled, the government encourages initiative in this direction. The results are encouraging. Between the years 1903 and 1912 the area of cultivated land rose from 3,155,000 hectares to 4,296,000, besides which the yield also augmented considerably. Assistance is likewise afforded in other ways by the Agrarian Bank, which, by advancing personal loans, mortgage loans, and loans on such security as agricultural produce, seeds, cattle, &c., and at fair rates of interest, keeps the peasantry from the clutches of the money-lender. This institution also purchases for farmers perfected implements and machines, fine breeds of cattle, and other requisites, and advances money to co-operative associations for the betterment of agriculture.

The main source of Bulgaria's revenue is, and will long remain, the fertility of her soil. Out of every 10,000 Bulgars, 8600 are occupied in agriculture or in agricultural industries. This fact has been recognised by all political parties as the cornerstone of their policy. For industry has such formidable obstacles to surmount, owing to the lack of capital, labour, and coal, that the repeated efforts of the authorities to foster it by legislation have produced but slender results. Skilled labour can hardly be said to exist. The peasant is willing to work in a sugar factory, a brewery, or a distillery, but only on condition that he shall be free to attend to his farm at the various seasons when it needs his care. The state encourages industries and prefers the native to the foreign product, even when price and quality are on the side of the latter. None the less, however, industry is still in an inchoate state. Even coal, which is worked at Pernik, near Sofia, is expensive, as well as of inferior quality. It is worth noting, however, that textile fabrics are exported to Turkey, and that during the Balkan war the Turkish soldiers were clad in cloth woven by their enemies.

Bulgaria's commerce consists in the exportation of agricultural produce, and the importation of raw materials and manufactured goods. Despite serious obstacles it has made progress proportionate to the political expansion of the realm.

The artificial ways of communication are inadequate

and defective; the natural waterways, on the contrary, are good. About half of the traffic is transported over the Black Sea, where Bulgaria has two ports—Burgas, which, at first atrophied by the prohibitive tariffs of the Oriental Railway Company, has been employing considerable activity since 1908, when it became Bulgarian; and Varna, the importance of which is dwindling since the Dobrudja was ceded to Rumania in 1913. The Danube, which bounds the kingdom on the north, is less serviceable to Bulgarian commerce than it may seem, owing to its being blocked with ice for several weeks every year, and to the slowness of navigation against the stream. None the less, a fourth part of the traffic is borne on this river. Land routes absorb the remaining fourth of Bulgaria's traffic in spite of the heavy toll it pays in passing through the territories of trade competitors. The port of Dedeağatch, which was allotted to Bulgaria by the treaty of Bucharest, was lost by that of Neuilly in 1919.

The population of the Bulgarian kingdom before the Balkan wars was 4,329,108. The number of inhabitants who passed under Bulgaria's sway with the territory annexed in August 1913 was 709,646. From the total must be deducted the 285,757 subjects whom Bulgaria lost to Rumania by the cession of the Dobrudja. Cessions to Serbia and Greece in 1919 cost her about 112,500 and 320,000. The 1920 census gave a total of 4,861,439. The fecundity of the Bulgarian people is considerable. The census, which is taken every five years, shows a regular average increase of 10 per cent. The loss of about 100,000 men who were killed or crippled in the two Balkan campaigns was less acutely felt in the economic life of the nation than might have been anticipated. For the land owned by peasants being cultivated by the combined labour of the whole family, if one member disappears, the others work a little harder to achieve the same results. Thus when the able-bodied men were at the war the seeds were sown by women and children; and later on, when harvest-time drew near, and the Turks imagined that the soldiers must exchange the rifle for the reaping-hook, it was again the women, children, and old men who gathered in the crops.

The financial condition of Bulgaria leaves much to be desired. In public as in private life economy is the characteristic trait of the people, and the Court of Accounts not only scrutinises every sum actually spent, but also has the right to veto every order to pay. The weight of the public debt was greatly increased by the wars of 1912-18. Bulgaria's financial system hinges on the National Bank, which is bereft of independence by the state. This institution accepts deposits from public departments and private persons; advances loans secured by mortgages to communes, state institutions, and individuals, or on security of bills, goods, and bills of lading; discounts Treasury bonds and commercial bills; receives the state revenues, and pays out sums on behalf of the government to the extent of these revenues. It also opens credit accounts to officials who are not always solvent and to the state without limit or real guarantee. All the funds of the savings banks are deposited in the National Bank, which issues notes up to a sum that must not exceed the triple of its capital and reserve fund. But as the coffers of the bank are filled with paper, a run on it would prove fatal to it; and yet, although this is well known throughout the country, public confidence is still unshaken. But as this confidence cannot be communicated to foreign creditors, the premium on gold, which the National Bank never gives in exchange for its notes, is considerable and increasing.

In consequence of the universality and distribution of land, pauperism is unknown in

Bulgaria. Everybody is poor; nobody is in want. Extreme thrift is practised in the household, the only exception being expenses incurred for the education of children. Here the Bulgarian paterfamilias is not only generous with his savings, but he sometimes actually borrows. Education was made obligatory and gratuitous by the Constitution. Every commune must support a public school, either alone or conjointly with the adjacent villages. The municipality provides and repairs the building, while the state pays the staff. Bulgaria possesses about one educational institution to 880 inhabitants. Manual, and especially agricultural, labour is carefully taught in the primary schools. A number of colleges and intermediate schools prepare candidates for the university, the seat of which is Sofia. In Bulgaria, as in most Balkan countries, the number of university graduates is disproportionately great, and their influence on the tone of public life is lowering. The state leaves too little to private initiative.

Professional politicians, whose ranks are recruited from the unemployed of the liberal professions, are the real scourge of the country. Parliamentary parties rally round leaders instead of allowing principles to form their lines of cleavage. Once a party has quitted office, all its acts are closely scanned by its successors with a view to impeaching the ex-ministers, the crime alleged being generally corruption; and this paralyses effort and checks initiative. To these disputes the bulk of the nation is indifferent; but the sovereign utilises them for the maintenance and extension of his royal prerogative and personal influence. And to-day the king is the source of all power. He occupies in Bulgaria a position analogous to that of Wilhelm II. in Prussia. Thus it is not a parliamentary majority but the king who dismisses every cabinet and chooses the party and the ministers who shall succeed it in office. An administration with an overpowering and compact majority in the *Sobranie* may be suddenly dismissed and a group with hardly a dozen parliamentary representatives called to power. And the electors invariably return the partisans of the minister who has responded to the monarch's call. The name constitutional applied to such a régime is a misnomer. The chief of the state generally adjusts these sudden moves to the exigencies of his foreign policy, the aim of which was so to steer his course between Russia and her Teutonic rivals as to harvest in the maximum of profit from each without binding himself irrevocably to either. But after the proclamation of Bulgaria's independence he uniformly followed the lead of the Central European powers, while relying on Russia's generosity should the experiment lead to disaster. Austria's aim was to help Ferdinand to create a great Bulgarian tsardom, extending if possible from the Golden Horn to the Adriatic, and thus permanently to paralyse the Serbian peoples. It was this perspective that moved King Ferdinand to make war upon his own allies, the Greeks and Serbs, in 1913; and it was this hope that determined the Bulgarian people, irritated though they were by the calamity which followed, to curb their wrath against the king, who persuaded his ministers that Austria would come to the rescue and repair the sinister consequences of his miscalculations. In 1915 Ferdinand again interposed against the Serbs.

The Bulgarians, commonly classed as Slavs, are in reality a composite people, the predominant ethnic element having been supplied by Finno-Ugrian hordes from the Volga, whence the name *Volgar* or *Bolgar*. Arriving in the Balkan Peninsula in the 7th century, they found the country inhabited by an Indo-European people, the Thracian Illyrians, who had settled there about 1700 B.C. Incurable in-

dividualists and devoid of the social sense, the Thracians were incapable of organising a stable empire, and endless internal discord rendered them an easy prey to the Slavs, who invaded the country in the 3d century. Anarchical by temperament, the Slavs, who had attained a much higher degree of culture than the Bulgar invaders, whose rigorous military discipline was maintained in peace, were soon conquered by these. But, like the Normans in England, the Bulgars in the Balkans assimilated the culture and adopted the language of the Slavs, which has since stood them in good stead. But the national character has undergone no sensible change despite the large admixture of foreign elements—Greek, Kutzovlach, Albanian, Gypsy, Armenian, and Jewish—which has taken place during the centuries which have elapsed since then. On the language, too, these ethnic accretions have hardly left a mark.

The Bulgarians are the Spartans of contemporary Europe. Black bread, garlic, paprica, maize, cheese made of sheep's milk, and sour milk are the staple food of the peasant, whose physical condition leaves nothing to be desired. The Bulgarian soldier can stand the fatigue and privations of a campaign better than any other in Europe, except, perhaps, the Russian. The birth-rate is very high, and families of ten and twelve children are not uncommon. The number of illegitimate children is but 4 per cent. in the country and 11 in the town. Even after their marriage, the sons often remain in their father's house, and continue to work in common. Marriage is as much an economic venture—the wife reinforcing the band of workers—as a matter of sentiment. Thrift carried to excess is one of the traits of the Bulgar, and its corollary is an isolated existence, involving few social duties and entailing no needless expense. To make money is the chief care of the average man and woman, and there is no more skilful bargain-driver than the Bulgar. And as the struggle for existence is severe, the artistic sense of the nation has never been developed. Religion is a rite among this austere people, and patriotism a cult. The Bulgarian worships his country, and accounts no sacrifice too great for its welfare. The least criticism of the national character or customs is taken to heart as a personal affront.

Under the constitution of 1879, amended in 1893 and 1911, the legislative authority is the *Sobranie*, a single chamber elected by direct general vote for four years, unless dissolved sooner by the king. For changes of constitution, or succession to the throne, acquisition or cession of territory, a Great *Sobranie* of double strength of numbers is elected.

History.—Bulgarian history before Christianity was introduced into the country is interwoven with that of Byzance. The pagan Bulgars constantly invaded the territory of the Greek emperors, by whom they were sometimes defeated and sometimes bought off. Koo-brat, chief of the Volga Bulgars, having united the Dacians with his own people, was the first who endeavoured to establish an organised state. The Emperor Heraclius treated him as an equal, and obtained his alliance in return for honours and gold (601-641 A.D.). But his five sons undid what their father had achieved, and plunged their people in anarchy. Koo-brat's capital was situated in what is now a village of the Russian province of Kazan, where the ruins of his ramparts are still visible. After many encounters with Russians, Franks, and Byzantines, under Asparoukh and other chiefs, the Bulgars under Terbel, a great military leader, a wise law-giver, an unscrupulous and cruel ruler, saved Constantinople from the hands of the Saracens. Another man of mark was Kroum (802-815), who took Sofia and Adrianople, strengthened the monarchical

power, rendering it hereditary instead of elective, gave severe laws, and offered human sacrifices to the gods.

Prince Boris, one of the greatest of Bulgaria's rulers, embraced Christianity (865) in order to gain access for his subjects to the source of civilisation and progress, and fifteen years later the Bulgarian Church was declared to be subject to Byzance. His successor, Simeon, abandoning the career of a monk, waged successful wars against Byzance, forced the emperor to pay him tribute, and finally proclaimed himself autocrat of all the Bulgars and Greeks (921). His empire extended from the Black Sea over Thrace, including Adrianople, Macedonia, Albania, and Epirus to the Gulf of Arta, and along the Adriatic seaboard. Prishtina and Belgrade were among his possessions. Under Peter I. the Petchenegs of Russia invaded Bulgarian territory, and dealt the first blow to the empire. The spread of the sect of the Bogomils intensified domestic strife, and in 963 the realm split into two halves, the eastern and western. The battle of Belacitsa (1014), in which 15,000 Bulgarian prisoners had their eyes gouged out by Basil II., known as 'the slayer of Bulgars,' gave the death-blow to the realm, which was incorporated in Byzance. Later on a successful revolution, under Assen (1186), culminated in the proclamation of Bulgarian independence, which was firmly established two years later with the help of the Serbs. With the extinction of the Assenide dynasty in 1258 the Serbian element became preponderant, and finally the loss of Sofia (1382) to the Turks, and the defeat of the allied Serbian and Bulgarian troops by Murad at Kosovo (1389), put an end to the independence of Bulgaria. It was not until the 19th century that the people, at first with Russia's encouragement, and then with her active assistance, awakened to new life. Since then it may be fairly said that Bulgaria owes much of what she has, and is, to her Russian liberators and protectors. The beginning of a national awakening dates from the year 1762, when the monk Paysios, then at Mount Athos, wrote the national chronicles, and revived memories of ancient glory. A new national literature began; the first Bulgarian school was opened in 1835, and was followed by others. A newspaper appeared in 1844. The Crimean war stirred up Slavonic sympathies which Russia had sedulously and naturally cherished. In 1872 the Bulgarian Church and archbishop became again independent of the hated supremacy of the Greek patriarch.

During the troubles in Bosnia and Herzegovina in 1875 excitement in Bulgaria began, but two or three ill-organised local risings in 1876 were swiftly suppressed by Turkish troops. The unconcealed aspirations of the Christians provoked the suspicions and fears of the Moslems, and the Turkish inhabitants of Bulgaria rose against their unarmed Christian neighbours, assisted by the notorious Bashî-Bazouks, or irregular troops. In the provinces of Philippopolis and Trnova fifty-eight villages had by June 1876 been destroyed, and twelve thousand men, women, and children cruelly slain. The 'Bulgarian atrocities' awakened horror throughout Europe, especially in England; and a conference at Constantinople proposed to the Porte the organisation of two autonomous provinces. The Porte refused to make concessions. Russia, in its assumed capacity as guardian of the Slav peoples of Turkey, declared war (1877). By the treaty of San Stefano, the victorious Russians (March 1878) proposed to constitute a Bulgarian state within the limits of the old kingdom, extending from the Danube across Macedonia to the Ægean. But the dissatisfaction of Austria and Britain with the proposed arrangement led to the Berlin Congress; and the Berlin treaty (13th July

1878) constituted an autonomous, though tributary, Bulgaria north of the Balkans, whilst to the mainly Bulgarian province south of them, that of Eastern Rumelia, it granted administrative autonomy. The prince of Bulgaria, freely elected by the people, was to be confirmed by the Porte with the assent of the Powers. The first choice of the Bulgarians was Prince Alexander of Battenberg, a cousin of the Grand-duke of Hesse (1879). In 1885 the outbreak of a revolution in Eastern Rumelia, and Prince Alexander's acceptance of its union with Bulgaria, provoked the jealousy of Serbia; Milan invaded Bulgaria; and in the fourteen days' war which ensued the Bulgarians suffered temporary defeat, till, at Slivnitsa, Prince Alexander turned the tide of fortune, entered Serbian territory at the head of 50,000 men, and captured Pirot. The Sultan recognised the *fait accompli*, and the Powers thereafter treated Bulgaria and Eastern Rumelia as one country. The prince, who ere long fell into disfavour with Russia, was in 1886 kidnapped by Russian partisans and carried into Russia; and though he returned, he felt himself compelled to abdicate owing to Russian hostility. In 1887 Prince Ferdinand of Saxe-Coburg, against the will of the great Powers (especially of Russia), accepted the throne, but was fully recognised only after the death of Stambolov (q.v.) in 1895 had rendered possible a renewal of cordial relations with Russia. Great part of the interior of Macedonia is occupied by Bulgarians, and the troubles in Macedonia were due as much perhaps to the religious rivalry (see GREEK CHURCH) and race-hatred of Bulgarians and Greeks as to the oppression of the Turks. The free Bulgarians strongly sympathised with their kinsfolk under Turkish sway. Soon after the constitutional revolution in Turkey in 1908 the Bulgarian nation declared itself independent of Turkish suzerainty, and its prince named himself a Tsar. Sinking their differences for a moment, Bulgaria, Greece, and the two Serb kingdoms in 1912-13 made war on Turkey (q.v.); but in 1913 Bulgaria, isolated against her former allies as well as Turkey and Rumania, had to yield a great part of her share of conquered Turkey, and cede the north-east corner of her old territory to Rumania. Nevertheless she came out of the two wars with considerably increased area, and an Ægean seaboard. Bulgaria entered the Great War (q.v.) in 1915 upon the side of the Central Powers, whose successes seemed to offer an opportunity of repairing her losses. She surrendered in 1918, and in 1919 by the treaty of Neuilly submitted to disarmament and loss of territory to Yugoslavia and Greece. Ferdinand abdicated in favour of his son, Boris III.; and soon after Mr Stamboliiski, the Agrarian leader who had been in prison throughout the war for his opposition to the king's policy, became prime-minister. Compulsory labour for the state was enacted, the larger estates distributed among peasants, and the Radoslavov ministry was impeached for entering the war. The failure of the Sèvres settlement with Turkey reopened the question of Thrace.

Language and Literature.—The original Bulgarian was of course an Ural-Altaic or Ugrian language, but it has left only a few traces in the Slavonic speech adopted by the Bulgarians who settled in the Balkan Peninsula. The old Bulgarian Slavonic tongue is closely allied to the Great Russian, but some Serbian, Greek, Romanic, Albanian, and Turkish elements have found their way into the language. The literature in the old palmy days consisted chiefly of translations from the Greek, and theological works. The modern literature (since 1762) is chiefly educational and

popular and political. The poems of Slaviikov, the novels of Karavelov, the historical works of Drinov, deserve mention. Ivan Vazov (1850-1921) was the most notable of Bulgarian writers, not only for his lyric and epic poems, but for his novels and short stories. *Under the Yoke* was translated by Edmund Gosse. There is also a rich lyrical popular poetry. The Cyrillic alphabet (shorn of three letters by the government in 1921) is that ordinarily used, as in Russian—namely, that modified out of the Greek by Cyril (q.v.).

See A. Xenopol, *L'Histoire des Roumains de la Dacie Trajane*; G. Schlumberger, *L'Épopée Byzantine*; *Bulgaria of To-day* (Bulgarian Ministry of Commerce and Agriculture, London, 1907); R. P. Guérin Songoon, *Histoire de la Bulgarie* (Paris, 1914); L. de Launay, *La Bulgarie d'Hier et de Demain* (Paris, 1912); *Constitution du Royaume de Bulgarie, votée le 16 Avril 1879, et modifiée le 15 Mai 1893, et le 2 Juillet 1911* (imprimerie de l'État, Sofia, 1911); R. Pelletier, *La Vérité sur la Bulgarie* (Paris, 1913); L. Payacoff, *Les Finances de l'État Bulgare et M. Sallabacheff* (imprimerie de la Cour, Sofia, 1909); G. Bousquet, 'L'Effort Bulgare' (*Revue de Paris*, Feb. 1914); G. Clenton Logio, *Bulgaria: Problems and Politics* (1919).

Bulgaria, a mediæval Finno-Ugrian kingdom on the middle course of the Volga, whence it took its name. The Bulgars in the 7th century A.D. conquered the Balkan country now known as Bulgaria, where they became Slavonised. See the foregoing article, especially the section on *History*. Those who remained behind became Mahomedans. For their history, see KIPCHAKS, KAZAN; and for their capital, BOLGARY.

Bulgarin, FADDEÏ VENEDIKTOVICH, Russian author and journalist, born in Minsk in 1789, served in the Russian army, but finding himself neglected, in 1810 joined Napoleon. In 1819 he returned to St Petersburg, where his writings soon attracted notice by their intense satire and intense servility. In 1825 he started the *Sévernaja Pchela* ('Northern Bee'), a daily paper, which for long was alone permitted to discuss political questions. He was a privy-councillor at his death, 13th September 1859. A zealous supporter of reaction and of absolutism, he enjoyed, through relations with the secret police, an unlimited power, which he freely used to the detriment of opponents. He was a witty and a versatile writer, and published travels, histories, novels, and statistical works, some of them of value. His *Memoirs* appeared in 6 vols. in 1846-50 (Ger. trans. Jena, 1858-61).

Bulkheads, in a ship, are the partitions between the several portions of the interior, whether to separate it into compartments to suit the exigencies of stowage or loading, or as a safeguard against foundering (see BUOYANCY). Bulkheads are either *transverse*—i.e. running athwart the vessel—or *longitudinal*—i.e. in the direction of the vessel's length—and are usually made watertight, thus dividing the interior of the vessel into three, four, or more compartments, each of which is self-contained, and watertight in reference to its neighbours. Should any one of the compartments, through damage to the skin of the vessel, be laid open to the sea, its self-contained character prevents the water penetrating the other compartments, thus lessening the risk of foundering, if not altogether removing it. In very many of the modern high-class mail and passenger steamships, the hull is subdivided to such an extent that if any two compartments be simultaneously laid open to the sea, the vessel still retains sufficient floating power. The Merchant Shipping Act of 1854 provided for the fitting of a certain number of bulkheads in steamers, but the growth in ship dimensions soon rendered this inelastic provision utterly useless, if not mischievous, and it was

repealed in 1862; Lloyd's Registry virtually assuming the functions which the Board of Trade then resigned. The loss of the *Titanic* in 1912 revived discussion on the Board of Trade's responsibility, and created a widespread demand for both longitudinal and transverse bulkheads in all passenger-ships of a certain size. See SHIPBUILDING.

In sailing-ships the only one usually considered necessary is that nearest the bow, to provide against damage to the bow through collision. In numberless instances the 'collision bulkhead' has saved the vessel which struck another 'bow on.'

The practice of carrying water ballast in the bottom of merchant steamers, to secure the requisite stability when unloaded with cargo, has resulted in various types of double or cellular bottoms. The presence of the inner and watertight bottom in such cases has not infrequently saved the vessel after grounding on rocks.

In iron war-vessels, which have inner bottoms, there may be hundreds of compartments, each of which is watertight as regards its neighbours and provided with a watertight door. In ships with several screws each engine is in a separate compartment (see NAVY).

The word is also used for the roof of a bulk, or for a bulk itself, that is, a stall or projecting framework in front of a shop—familiar in literary biography of the 18th century as the sleeping-place of ill-remunerated authors.

Bull. See CATTLE.

Bull. The word is derived from the Lat. *bullā*, 'a bubble of water,' and then 'a round ball of any kind.' In the middle ages it came to signify the capsule of the seal appended to letters from emperors or popes, next it was used for the seal itself, and lastly for the document to which the seal was appended. Its use is now commonly restricted to papal documents issued with certain indispensable formalities.

These formalities have varied greatly from age to age, and we must content ourselves with an account of the modern practice down to December 1878, and of the changes made at that date by the reigning pontiff Leo XIII. Down to that time, a bull had a seal, usually of lead, occasionally of gold, attached to it. On one side was the official name of the pope (e.g. Gregory XVI., Pius IX.), on the other the heads of Peter and Paul, separated by a cross and surmounted by the letters SPE (i.e. 'Sanctus Petrus') and SPA (i.e. 'Sanctus Paulus') respectively. The seal was fastened by red or yellow silk, or by uncoloured hemp, according to the nature of the contents. Bulls were written on strong parchment and in the Latin tongue. They began with the words 'N. episcopus servus servorum Dei dilecto filio (or dilectis filiis, &c.), salutem et apostolicam benedictionem.' Sometimes in cases where permanent decisions were given or privileges of great moment conferred, the words 'In perpetuum,' or 'In æternam rei memoriam,' were substituted for 'Salutem et apostolicam benedictionem.' Sometimes, also, when no special persons were addressed, 'In perpetuum,' &c., immediately follows the 'Servus servorum Dei.' Usually signatures are added below in testimony that the bull is authentic. Formerly it was common for the cardinals to sign; later on this was done by various members of the curia, specially by the protodatory, secretary of briefs, and vice-chancellor. The bull is dated according to the year of the incarnation, the year of the pontificate, and the day of the month after the old Roman reckoning. The character used from the reign of Adrian VI. to our own day is of that crabbed and indistinct kind known as 'litera S. Petri,' or in Italy as the 'carattere bollatico' or 'teutonico.' Finally,

the bull is expedited from the apostolic chancery in the Vatican.

By a *Motu proprio* of December 9, 1878, Leo XIII. ordained that the leaden seal in use for more than a thousand years should be employed henceforth only in case of bulls concerning collations, erections, and dismemberments of greater benefices (reserved to the pope), and other solemn acts of the holy see. In other bulls, 'especially those relating to ordinary benefices and marriage dispensations, the old leaden seal is to be replaced by a red one stamped on the parchment itself, with the heads of St Peter and St Paul surrounded by the name of the reigning pope. The ordinary Latin current writing is henceforth to displace the Gothic character.

The divisions of bulls into different species—e.g. 'consistoriales,' issued after consultation in consistory; 'dimidiæ,' by a pope not yet crowned, &c.—possess little general interest. If we add to the words of Leo XIII., just quoted, bulls conveying doctrinal decisions, we have a correct idea of the objects for which bulls are published. It is a mistake to suppose that bulls are always, and of necessity, more important than briefs.

A *Bullarium* is a collection made without official authority of papal documents (not necessarily bulls in the strict sense) which have not found a place in the *Corpus Juris*. A bullarium may contain the acts of a particular pope, or may be limited to bulls relating to particular orders, churches, &c., or it may comprise bulls of all ages, and on all kinds of subjects, excluding only those already to be found in the *Corpus Juris*. The first bullarium appeared at Rome in 1586, edited by Cherubini. The most convenient is that published at Turin (24 vols. 1857-72).

Bull, a ludicrous blunder in speech implying some obvious absurdity or contradiction. The origin of the name is unknown. It has been sought in the contrast in papal bulls between the humility of the title, by which the pope styles himself 'servant of servants,' and his assumption of absolute supremacy and authority over the world—an unlikely explanation. It is found with much the same sense as early as the 14th century in the *Cursor Mundi*. Bulls in their best form are usually alleged to be an especial prerogative of Irishmen—at least it is certain that the best examples have come from Ireland. Coleridge, remarking on the well-known bull, 'I was a fine child, but they changed me,' says: 'The bull consists in the bringing together two incompatible thoughts, with the sensation but without the sense of their connection.' Sydney Smith, whose authority is supreme in this region, says: 'A bull is an apparent congruity, and real incongruity of ideas, suddenly discovered.' It is 'the very reverse of wit; for as wit discovers real relations that are not apparent, bulls admit apparent relations that are not real.' See the *Essay on Irish Bulls* (1803) by Miss Edgeworth and her father.

Bull, GEORGE, D.D., divine, was born at Wells, Somersetshire, in 1634, and studied at Exeter College, Oxford, whence he retired in 1649, having refused to take the commonwealth oath. Ordained in 1655, he took the small parish of St George's, Bristol, and subsequently obtained the rectory of Siddington, Cirencester (1658), that of Avening, Stroud (1685), the archdeaconry of Llandaff (1686), and the bishopric of St Davids (1705). He died at Brecknock, 17th February 1710. His *Harmonia Apostolica* (1670), whose object was to reconcile the apostles Paul and James on the subject of justification, occasioned considerable controversy among divines, and, in answer, Bull published his *Examen Censuræ* and *Apologia pro Harmonia*. His greatest work, the *Defensio Fidei Nicenæ* (1685), was directed against

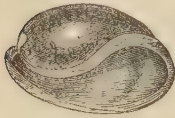
Arians and Socinians, Tritheists and Sabellians; for his *Judicium Ecclesiæ Catholicæ* (1694) the thanks of the whole French clergy were sent to him through the celebrated Bossuet. These are included in Dr Burton's edition of his works (8 vols. Oxford, 1827), to which is prefixed a Life by R. Nelson; and they are translated in the *Library of Anglo-Catholic Theology* (Oxford, 1842-55).

Bull, JOHN, a generic name for an Englishman as a personification of what is supposed to be the English type, from Arbuthnot's use of the name in his *History of John Bull* (1712; reprinted complete in Pope's 'Miscellanies' in 1728). The subject of that history is the 'Spanish Succession during the reigns of Queen Anne and Louis XIV.' Queen Anne is 'Mrs Bull'; 'John Bull's mother' is the Church of England; and 'John Bull's sister Peg' is the Scotch nation, represented as in love with Jack (*Calvin*). The description of Bull is so close to the familiar figure in the pages of *Punch* that a sentence or two must be quoted: 'Bull in the main was an honest plain-dealing fellow, choleric, bold, and of a very inconstant temper. He dreaded not old Lewis (Louis XIV.), either at back-sword, single falchion, or cudgel-play; but then he was very apt to quarrel with his best friends, especially if they pretended to govern him. If you flattered him, you might lead him as a child.'

Bull, JOHN, musician, born in Somersetshire about 1563, was appointed organist in the Queen's Chapel in 1591, first music lecturer at Gresham College in 1596, and organist to James I. in 1607. A Catholic, he fled beyond seas in 1613, and at Brussels entered the archduke's service; in 1617 he became organist of Antwerp Cathedral, and there he died, 12th March 1628. Little of his music has been printed. The claim advanced for him to the authorship of 'God save the King' (see NATIONAL HYMNS) is better founded than the impossible story of his adding, within a few hours, forty parts to a composition already written in forty parts; but from the extreme difficulty of his instrumental music, it would appear that his great reputation as an organist was deserved.

Bull, OLE BORNEMANN, a famous violinist, was born 5th February 1810, at Bergen, in Norway. His father's opposition only deepened his natural passion for music. In 1829 he went to study under Spohr at Cassel, but was so coldly received that he betook himself to Göttingen to study law. But music soon asserted its mastery over him, and an acquaintance with Paganini gave him the impulse that he needed. He accompanied his master to Paris, but here his fortune sunk so low that he thought of drowning himself in the Seine. The patronage of a lady of rank saved him, and soon he rose to fame as a violinist. His style of playing was in some respects like that of Paganini. He was received in Italy with prodigious enthusiasm, and after visiting England, Scotland, and Ireland, he made a tour of triumph through Russia, Germany, and Norway. In 1843-45, in 1852-57, in 1867-72, and other years he conducted a series of musical tours in America, where he made enormous sums by his concerts, much of which he lost by unfortunate land speculations, especially an attempt to found a colony of Scandinavians in Pennsylvania. This turned out a complete fiasco, and once more Bull had to take to his violin. He afterwards paid a third visit to the United States, but returned to end his days in Europe. He died at his villa near Bergen, 17th August 1880. If it is not true that he was half charlatan, half genius, it may be said with truth that he was quite as much a bizarre virtuoso as a great artist. His compositions have had but little reputation apart from his own playing. See the Memoir by Sara C. Bull (1886).

Bulla, or BUBBLE-SHELL, a genus of Gasteropod Molluscs, formerly somewhat ambiguous, but now defined as one of the Tectibranchs or 'snails' with



Bulla aperta.

concealed posterior gills. In the family (Bullidae) to which the bubble-shell belongs, the shell is thin, often almost globular, with concealed spire and wide aperture. It serves to protect the gills, and less frequently the entire animal. In some cases it is quite covered by the mantle and foot lobes. In the closely allied Haminea, the shell is horny and elastic; in the Sea-hares (*Aplysia*) it is very rudimentary; in some of the likewise nearly related Philinidae it is entirely absent. The Bullidae are carnivorous, and limy plates in the gizzard aid in internal mastication. There are numerous fossil and living species, all marine, and some British. See GASTEROPODS.

Bulla, a metallic seal. See BULL, and SEAL.

Bullace (*Prunus insititia*), a shrub or small tree, larger and much less spiny than the sloe, but very closely allied to it, as it is also to the plum, so that many botanists regard them all as one species (see PLUM). The fruit is larger than the sloe, generally globose, and although it partakes in some degree both of the acidity and the roughness of the sloe, it is not unpleasant, especially after having been mellowed by frosts, and makes excellent pies or tarts. 'A bullace-pie is a standing dish at the harvest-home supper in the south of England, only it requireth rather more sugar than the housewife is always willing to allow.' The bullace is common in hedges, coppices, and banks in England, and in many parts of Europe, and is sparingly naturalised in the United States.

Bullace-plum, the Jamaican name of the pleasant fruits of *Melicocca bijuga*, a sapindaceous tree introduced from Guiana and New Granada.

Bullæ, or BLEBS, are collections of serous fluid of considerable size, situated immediately beneath the cuticle, and raising it from the true skin. They differ from vesicles only in size; and no very definite line can be drawn between a large vesicle and a small bulla. They usually vary in diameter from a quarter of an inch to two inches. The most familiar examples are the 'blisters' produced on the hands by rowing, or the feet by walking. They are met with occasionally in many diseases of the skin—e.g. eczema, erysipelas, urticaria, scabies, &c.; but in pemphigus and in some forms of hydroa they constitute the chief feature of the disease.

Bull-baiting, a barbarous sport, once very popular in England, and in which all classes of society delighted equally. A number of dogs were set on to attack a bull; and in order that he might be made as furious as possible, his nose was sometimes blown full of beaten pepper before he was turned loose. Another form of the sport was to fasten the bull to a stake, by a rope of some yards' length, and to set bulldogs on him, one at a time, which were trained to seize him by the nose—which, when accomplished, was called *pinning* the bull. But no small part of the enjoyment of the spectators was derived from the success with which the attacks of the dogs were met by the bull lowering his head to the ground, and receiving them on his horns, often tossing them to a great distance. King James I. greatly delighted in this sport; and when the Tsar Nicholas I. of Russia visited England, before his accession to the empire, a boxing-match and a bull-baiting were got up to show him English tastes. Bull-baiting was declared illegal in 1835.

An equally barbarous sport, termed *Bull-running*, was formerly practised at Stamford and Tutbury, where men and women took the place of dogs, maddened the bull with hideous noise, and then pursued it with 'bull-clubs,' till the wretched brute sank under the blows of its assailants.

Bulldog, a breed which is regarded as peculiar to England, the only country in which it has been kept pure. The bulldog disputes with the greyhound the honour of being the oldest known dog. The general appearance of the bulldog is that of a smooth-coated, compact dog, low in stature, but broad and powerful, with a massive head, large in proportion to its body, which is short and well knit. The bulldog should convey an impression of determination and strength, without unwieldiness. The following are its principal points: Head as large as possible, measuring over 20 inches in circumference in first-rate specimens;



Bulldog.

forehead flat, with the skin much wrinkled, with a groove or indentation called the 'stop' running up between the eyes; ears small and thin, folding over at the back, showing the inside; eyes round, black, and not bloodshot; the face very short, the nose being set almost between the eyes, allowing the dog to breathe while pinned on to the bull in the old days of bull-baiting; upper lip joining the lower, quite covering the teeth, which should not project; shoulders sloping back and muscular; body well ribbed up, with the belly tucked up; back short, narrow at the loins, the spine rising from the shoulders to the loins, and curving to the tail, forming an arch, a characteristic of the breed termed 'roach-back'; the tail short and smooth, with a slight twist which prevents it being raised high—an abortive or 'screw-tail,' though common, is not a good point; forelegs straight-boned, but carried wide apart, presenting a bowed appearance; action, a peculiar roll, the body swinging between the forelegs; colour, brindle, white, or fawn; weight about 50 lb. The bulldog was extensively used for Bull-baiting (q.v.), whence he derives his name. After the abolition of this pastime he fell into discredit, till his qualities as a devoted and faithful companion gradually restored his popularity. The bulldog shares with the gamecock the distinction of being the most fearless of animals, but in disposition is so lazy that he is slow to take offence, though he will fight to the death if attacked.

The BULL-TERRIER was originally a cross between the bulldog and the terrier, but is now a distinct breed. He combines the courage of the bulldog with the activity of the terrier; his quickness and sagacity make him a good companion,

fearless, of combative powers, but not necessarily quarrelsome; head long, muzzle of great strength, body lightly ribbed but powerful, colour white.

Bullen, ANNE. See **BOLEYN**.

Bullen, ARTHUR HENRY (1857-1920), prepared a series of scholarly reprints (15th Century Carols, 1884; Elizabethan Lyrics, 1886-91); edited Marlowe, Middleton, and other Elizabethan dramatists, and Thomas Campion; and founded the Shakespeare Head Press at Stratford-on-Avon.

Bullen, FRANK THOMAS (1857-1915), till 1883 a sailor, made notable additions to the literature of the sea—*The Cruise of the Cachalot* (1898), *The Log of a Sea Waif*, *Deep Sea Plunderings*, *A Whaleman's Wife*, *Told in the Dog Watches* (1910).

Buller, CHARLES, born in Calcutta in 1806, was educated partly at Harrow and at Cambridge, but during 1822-24 was Carlyle's pupil at Edinburgh. He was called to the English bar in 1831, and entering parliament as a philosophical Radical before the Reform Bill, continued a member till his untimely death, 29th November 1848. He accompanied the Earl of Durham (q.v.) to Canada as his secretary, and was credited (erroneously according to Sir C. P. Lucas in his edition, 1912) with the main share in writing the Governor-general's famous report on Canadian constitutional reforms.

Buller, SIR REDVERS HENRY, general, born in 1839, entered the army in 1858. He served in China (1860), the Red River expedition (1870), the Ashanti (1874) and Kaffir (1878) wars, the Zulu war (1878-79, where he won the V.C.), and the Egyptian war. In 1898 he had the chief command at Aldershot, and was sent to South Africa as commander-in-chief in 1899, but on the arrival of Lord Roberts he assumed the divisional command in Natal, where, after very severe fighting, he succeeded in raising the siege of Ladysmith. He returned home in 1900, and in 1901 was reappointed to his former command at Aldershot, but owing to an indiscreet speech in answer to criticisms on his conduct during the war, he was retired on half-pay in October 1901. He died 1st June 1908.

Bullet is the leaden projectile discharged from any kind of small-arm. Formerly all bullets were spherical, and cast in moulds. Now all rifle-bullets are elongated, and cut by machinery from rods of lead. Robins's and Beaufoy's bullets were egg-shaped; Greener's, Norton's, Delvigne's, and others were of various shapes, with a plug, which, driven

This expanding or dilating action has been claimed by many inventors; but the government in 1857 awarded Mr Greener £1000, as the person who had practically solved the difficulty as far back as 1836. Its effect is to communicate a twist to the bullet, thus steadying it, and causing it to travel point first. This enables a heavier, because longer, projectile to be fired with accuracy from a smaller bore than was formerly used; thereby presenting less surface to the resistance of the air, and so increasing the range.

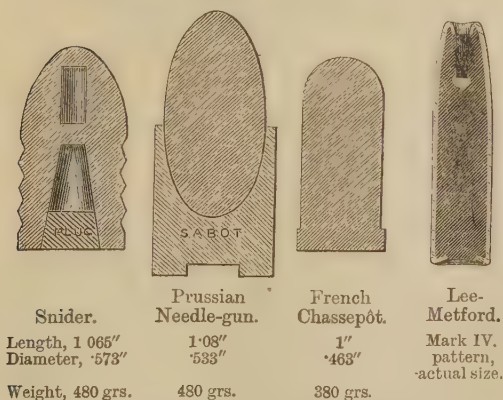
The Prussian needle-gun bullet did not touch the grooves; the *sabot* took them and communicated the twist to the bullet. The shoulders of the Chassepôt bullet and the slight taper in the Martini-Henry were for the same purpose. Hollow-headed explosive bullets are only used for shooting big game. Their use in war is forbidden by the Convention of Geneva.

The bullet of the Lee-Metford rifle (see **RIFLE**), which consists of a lead core covered with a nickel casing, weighs only 215 grains, as compared with the 380 grains of the Enfield-Martini of 1888. The *dum-dum* bullet was devised and made by the Indian military authorities in their arsenals at Dum-dum, near Calcutta, and is similar to the ordinary Lee-Metford bullet, with the point flattened and the lead exposed instead of being covered by the nickel casing. This caused it to expand when it struck, and made it much more effective than the original bullet. The soldiers in the Indian frontier wars filed off the points of the bullets themselves in imitation of the *dum-dum*. A Lee-Metford bullet (Mark IV.), with a hollow in the front end, intended to have the same 'stopping' property as the *dum-dum*, was issued for service in the British army in 1899; it is essentially the rifle-bullet of to-day. See the subject more fully treated in its connection with the weapon at **RIFLES**; also the articles **CANNON**, **CARTRIDGE**, **SHOT**, **SHELL**, and **MACHINE-GUNS**.

Bullet-tree, or **BULLY-TREE** (*Mimusops balata*), a sapotaceous tree found in Guiana, and valued for its wood, which is solid, heavy, close-grained, and durable, and also for its delicious cherry-like fruit. It yields balata-gum, a substitute for gutta-percha (see **BALATA**). The name is somewhat vaguely shared with other fruit-bearing trees. Thus *Bumelia retusa* is the Bastard Bully-tree, and *B. ingens* the Black Bully-tree, while *Lucuma mammosa*, of which the fruit is called the marmalade, is sometimes called Jamaica Bully-tree.

Bull-fights may have been practised by the Minoan Cretans. At all events they left many artistic representations of young men and girls leaping over bulls. See **MINOTAUR**. Combats of men with bulls for the entertainment of the public were common in Greece, particularly in Thessaly, and in Rome under the emperors, though in later times they were forbidden both by emperors and popes. They are still a favourite spectacle in Spain and Mexico, where, indeed, the *corrida de toros* is the national pastime. In Spain they were abolished by Charles IV.; but Joseph, Napoleon's brother, re-established them out of policy, the mass of the Spanish population being passionately fond of the sport. The most magnificent bull-fights were at one time instituted by the monarchs themselves; at present, in Spain, they are held either as private speculations or for the benefit of public institutions. So also in the city of Mexico. In Madrid the bull-fighting season commences in April and lasts until November. During that time there is at least one Sunday or Saint's-day afternoon in every week devoted to the sport. The proceeds go to the funds of the public hospital. The

TYPES OF RIFLE-BULLETS.



into the lead by the force of the explosion, caused it to expand and take the grooves in the barrel.

fight takes place in a kind of circus, called the *Plaza de Toros*, round which the seats rise one above another, like the steps of a stair, with a tier of boxes over them. The *Plaza* is capable of containing from 10,000 to 15,000 people, who pay a high price of admission, considering the rate of wages in Spain; and all go attired in their best to the spectacle. The Castilian bulls, usually chosen for fight in Madrid, are fiercer and more active, but inferior in strength to British animals. The horses engaged in the conflicts are worthless brutes, fit only for the knacker. The men employed in the fight are generally those who have been bred to it as a profession; but occasionally amateurs may take part in it.

The bull-fight has been described as a tragedy in three acts. The principal performers in the first are the *picadores*; in the second, the *chulos* are the only actors; the third and last act devolves solely on the *espada*. The *picadores* are all mounted, dressed like Spanish knights of the olden time, and armed with a lance; they take up their position in the middle of the circus, opposite the bull-stalls. The *chulos*, who are on foot, are gay with ribbons, and wear very bright-coloured cloaks; they distribute themselves in the space between the barriers. The *espada* or swordsman is also on foot. He is handsomely dressed, and holds in the right hand a naked sword, in the left the *muleta*, a small stick, with a piece of scarlet-coloured silk attached. On a sign given by the president of the sport, a bull is let out from the stalls; the *picadores* stand ready in the arena waiting his charge. With a brave bull, they find all their skill requisite in acting on the defensive; with a cowardly one, they act on the offensive; and should their stabs be ineffectual in rousing the animal to the requisite fury, the poor beast is hooted by the crowd, and ultimately stabbed ingloriously in the spine. Whenever a horse is wounded, the rider betakes himself to flight; and when either the above casualty happens, or a *picador* is thrown, the *chulos* rush in, and attract the bull by their cloaks, saving themselves, if need be, by leaping over the barrier which incloses the circus. At the same time, another *picador* calls off the bull's attention to himself by shouting. When the bull begins to flag, the *picadores* are succeeded by the *chulos*, who bring with them the *banderillas*—i.e. barbed darts about two feet long, ornamented with coloured paper-flags, which they stick into the neck of the animal. Sometimes these darts have crackers attached to them, the explosion of which makes the bull furious. The *espada* now enters alone to complete the tragic business. As soon as the bull's eye catches the *muleta*, he generally rushes blindly at it; and then the *espada*, if well skilled, dexterously plunges the sword between the shoulder-blade and spine, up to the very hilt, and the animal drops dead at his feet. A splendid team of mules then enter, glittering with flags and tinkling with bells, who drag off the slain at a gallop. The victorious matador is greeted with acclamations, and not less so the bull, should he wound or even kill his antagonist, in which case another matador steps forth into the arena; but human life is rarely sacrificed. From six to ten bulls are usually despatched in a single day, twenty minutes being about the time usually taken to slay one.

Every large town in Spain possesses a *Plaza de Toros*, and so do many towns in Spanish America; those of Madrid, Seville, and Cáceres are especially handsome. Bull-fighters personally are esteemed much as prize-fighters are in England; but they are the idols of the lower classes, from whose ranks they are drawn. Formerly those who were killed on the spot, and died without confession, were denied burial rites; but a clergyman

is now in attendance with the consecrated host, in case of accident.

Bull-fighting is not unknown in the south of France.

Bullfinch (*Pyrrhula rubricilla* or *vulgaris*), a bird of the great finch family Fringillidæ (q.v.), a little larger than the common linnet, and of a genus closely allied to the grosbeaks and crossbills. The genus is particularly characterised by the short, thick, rounded bill, of which the sides are inflated and bulging, and the tip of the upper jaw overhangs that of the lower one. The plumage is very soft and dense. The crown of the head, the long wing-feathers, and the tail are shining black. The back of the male is ashy gray, that of the female brownish gray. The under surface of the male is a bright tile-red, that of the female bluish gray. There is a conspicuous white bar across the wing. The tail of the bullfinch is almost even.



Bullfinch.

This bird is not unfrequent in England, Ireland, and the south of Scotland; and is found in most parts of Europe, from the south of Norway to the Mediterranean, extending eastward throughout Asia, even to Japan. It frequents woods and gardens, and builds its nest in trees or bushes a few feet from the ground. The nest is loose, made of dry twigs and fibrous roots. The eggs are four in number, bluish or purplish white, spotted and streaked with purplish gray and reddish brown. It feeds chiefly on seeds and berries in winter, and in spring is excessively destructive to the buds of fruit-trees in those localities in which it is abundant, selecting the flower-buds, and apparently finding them the most palatable of all food. Selby says: 'I have known a pair of these birds to strip a considerable sized plum-tree of every bud in the space of two days.' On this account gardeners are sometimes compelled to wage war against the bullfinch. He is also deliberately adjudged to be the farmer's enemy by impartial judges (see Wood's *Farmer's Friends and Foes*, 1888).

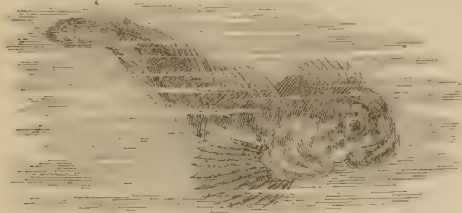
The song of this bird, in a wild state, is very simple, but it is remarkably susceptible of improvement by education. Some trained bullfinches can whistle an air very accurately, and with a power and variety of intonation far exceeding their natural song. The ability to whistle several airs well is rare. The training of these birds is a work both of time and trouble: it is chiefly carried on in Germany. Not less than nine months of training are requisite: it begins when the bird is a mere nestling, and must be carefully continued till after the first moulting; for it is a curious circumstance, that all which has been previously acquired is very apt to be lost at that time.

The bullfinch is capable of strong attachment to those who feed and caress it, and often becomes so domesticated as to show no desire for liberty (see CAGE-BIRDS). Curious variations of plumage are sometimes observed. The canary is closely allied.

Bullfinch, a goldfield in the Yilgarn district of Western Australia, 23 miles NNE. of Southern Cross on the line between Perth and Coolgardie. The finds in 1910 marked it as exceptionally rich; a boom set in at once, and a city of tents soon accommodated thousands of miners.

Bull-frog (*Rana mugiens*), a species of Frog (q.v.) found in most parts of the United States and Canada, but chiefly abundant in the southern states. It is of a large size, 8 to 12 inches long. The colour is olive green or reddish brown, with large brown or black spots, and with a yellow line along the back. The under surface is yellowish. It receives its name from the remarkable loudness of its voice, heard as a hollow bass in the frog concerts which take place in the evening and all night long in marshy places in America. Its voice can be distinctly heard at a distance of forty or fifty yards. It sits for hours during the day, basking in the sun, near the margin of a stream, into which it plunges with a great leap on the least appearance of danger. It does not confine itself to insects and worms like smaller frogs, but eats fish and other frogs, and is said to be partial to young ducks, and to swallow them entire. Audubon says 'its flesh is tender, white, and affords excellent eating,' the hind-legs, however, being the only part used. He adds that these parts make excellent bait for the larger cat-fish, and that he generally used the gun for procuring bull-frogs, loading with very small shot.

Bullhead, or MILLER'S THUMB (*Cottus gobio*), a small fish in the Acanthopterygii subdivision, abundant in clear rivers and streams, in some parts of the British Islands, throughout the greater part of Europe, and in the north of Asia. It seldom exceeds 3 or 4 inches in length. The colour varies somewhat with the activity of the fish, but is brown on the upper parts, and white beneath.



Bullhead.

The fins are rather large, prettily spotted, and with rays slightly produced into spines. The general appearance is not unlike that of the Gurnards (q.v.). The smoothness of the slippery skin, and the quaint depressed head, have suggested its names, that of miller's thumb referring to the flatness caused by the miller's perpetually rubbing flour between finger and thumb. The bullhead eats all sorts of little animals and the spawn of rival genera. Its own is buried in a hole, which the female makes with her tail, and over the cradle the male watches. Its flesh is delicate, and, when boiled, is reddish, like that of the salmon.—The other British species of the genus *Cottus* (q.v.) are marine. The Sea-scorpion (*C. scorpio*), or Father Lasher (q.v.), is a common form which sometimes ascends rivers. The name bull-head is not usually given to any of them. A

sea-fish of a nearly allied genus (*Aspidophorus*) is sometimes called the Armed Bullhead; it is also known as the Pogge (q.v.).

Bullinger, HEINRICH, a Swiss Reformer, was born at Bremgarten, in the canton of Aargau, July 18, 1504. The son of a priest, who later embraced the reformed doctrine and married the mother of his five sons, he became acquainted with the writings of Luther during his studies at Cologne; next he attended the theological expositions of Zwingli at Kappel, and accompanied his master to the religious conference held at Bern in 1528, which resulted in the reformation of the canton. In 1529 he married a former nun, and two years later became pastor of the principal church at Zurich, and Zwingli's successor as leader of the reformed party in its struggle with the Catholics, as well as with the Zealots and the Lutherans. He took a principal part in drawing up the first Helvetic Confession at Basel in 1536, and aided by his counsel the struggling church both in France and England. He died September 17, 1575. Part of the story of his life he wrote himself in his *Diarium*. His history of the Reformation was edited by Hottinger and Vögel (3 vols. 1838-40). See the Lives by Pestalozzi (1858) and Christoffel (1875).

Bullion usually means uncoined gold and silver in bars or other masses, though occasionally it is used as practically synonymous with the precious metals, coined and uncoined. The origin of the word bullion in its present sense, as well as that of the French *Billon* (q.v.), and the corresponding Spanish *vellon*, seems to be as follows: Bullion originally meant the mint, where the alloy for the coinage was prepared and the coin stamped (either from the Lat. *bullia*, a round boss or stud, or stamp; or from the verb *bullare*, to boil or bubble); and hence it came in England to signify the standard metal of which the coins are made. In France, where the kings debased the currency much more than ever took place in England, *billon*, the mint, came to signify the base mixture issued therefrom.

It is difficult to obtain trustworthy statistics regarding the production and consumption of the precious metals even at the present time, and still more so at remote periods. For ancient and medieval times the reader may consult Jacob's *Historical Inquiry into the Production and Consumption of the Precious Metals*, published 1831, which was long regarded as the standard work on the whole subject. Recently, however, Dr Adolph Soetboer has made much more thorough investigations for the period 1493-1885, and his *Materials for the Study of the Precious Metals* is now the work most generally relied upon.

As regards the production of the precious metals, two great revolutions are to be observed in the 16th and 19th centuries. Between 1493-1520 the total production of gold and silver was in the proportion of about 57 per cent. of gold to 43 per cent. of silver (the value being reckoned at the actual value of the time), whilst between 1581-1600 the proportion became (in value) 17·2 gold to 82·8 silver. This change was principally due to the discovery of the silver mines of Potosi (1545). Between 1831-40 the production (in value) was 34·9 gold to 65·1 silver, and for the period 1851-55 the proportion had become 77·6 gold to 22·4 silver. This change was caused by the discovery of the great gold mines in Australia and California. The magnitude of these discoveries may be estimated from the fact that between 1493-1850 (358 years) the total production of gold is given at 4,752,070 kilograms, whilst between 1851-85 (35 years) it is given at 6,383,388 kilograms. The value of a kilogram of gold is £139, 10s. After 1855 the relative

production of gold to silver gradually declined, the figures for 1881-85 being 49.3 gold to 50.7 silver. The total production of gold (in value) was (1493-1850) about £663,000,000, and from 1851 to 1885 about £890,000,000; the total production of silver (estimated at its actual gold value at different times) was (1493-1850) about £1,472,000,000, and from 1851 to 1885 about £480,000,000. Annual gold production rose from £42,934,976 in 1897 to £97,985,185 in 1915. See *Gold Production Report* (1918).

The most remarkable fact in these changes is the slight effect on the ratio. Before the Potosi discoveries the ratio was (1521-40) about 11½:1, and from 1601-20 it was only 12¼:1. Again, before the gold discoveries the ratio was (1841-50) 15.83:1. In spite of the large gold increase (1851-55) it fell only 15.41:1. The doubling of the annual gold output (1897-1915) coincided with a rise in the ratio (40:1). The rise in demand for silver during the war period (1915-19) more than restored the old parity (15:1). See BIMETALLISM.

The production of the precious metals must of course be compared with their consumption or use. The principal uses are for coinage, including keeping up the coins to their full weight, for the arts, and for hoards. It is estimated that £40,000,000 yearly of gold is absorbed by the arts and in exportation to the East.

Bullock's Heart. See CUSTARD APPLE.

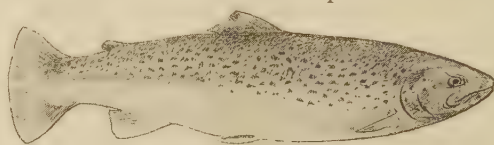
Bull-roarer, a provincial English name for a boy's plaything, made of a piece of wood about 8 inches long and 3 broad, sharpened somewhat at the ends, to one end of which a string 30 inches or so in length is tied, then twisted tightly round the finger, when the whole is whirled rapidly round and round until a loud and peculiar whizzing noise is produced. An instrument of the same kind, called *turndun*, is still used by the native Australians to produce a sound warning off intruders during several religious mysteries; and Mr Andrew Lang not only collected evidence of its similar use in New Mexico, New Zealand, and South Africa, but identified it with the *rhombos* used in the ancient Greek mysteries, itself an unconscious survival of more ancient and more savage mysteries. See 'The Bull-roarer,' in Lang's *Custom and Myth* (1884); Haddon, *Study of Man* (1898).

Bull Run, a small stream separating Fairfax and Prince William counties in Virginia, about 25 miles W. by S. of Washington, and giving its name to a famous American battlefield, where two battles were fought during the Civil War on July 21, 1861, and August 29, 1862. In the first the Confederate army of 22,000 men, commanded by Beauregard, with reinforcements of 8000, after a hard-fought contest, routed the Union forces, 34,000 strong, under McDowell, and drove them back on Washington with a loss of 2950 men. The Confederates' loss was 1652. In the second battle the Union forces of 49,000 men, under Pope, were defeated by Longstreet, with 32,000 men, and T. J. Jackson, with 23,000. The Union loss was 11,000, that of the Confederates 7241. See UNITED STATES.

Bulls and Bears. In the slang of the stock exchange, a *bull* is a person who seeks artificially and unduly to raise the price of stock, and speculates on a rise. On the other hand, a *bear* is one who speculates on a fall; who sells stock for delivery at a future date, in the hope that meanwhile prices will fall, so that he will buy at a lower price what he has sold at the higher price. See STOCK EXCHANGE.

Bull Trout. This name has given rise to much confusion, since it is applied to different kinds of fish in different localities. In the Tweed

the bull trout is the variety of the sea-trout which may most accurately perhaps be given the scientific name of *Salmo trutta eriox*. It was at an earlier date described as a distinct species under the



Tweed Bull Trout.

name of *S. eriox*. It is also known as the Round Tail, since in well-grown examples the caudal fin, instead of being forked or even straight, is emarginate, has an outwardly rounded outline, and the whole tail a distinctly stunted appearance. The fish is found in greatest abundance not only in the Tweed, but also in the Coquet. The flesh is not of very high quality, and the fish is only very rarely caught by the angler. In the two rivers named it has practically supplanted the true sea-trout. In the Tay the name bull trout is given to salmon which have speckled markings on the region of the 'shoulder' and fresh-water maggots in their gills. These are salmon which have spawned, but which, after descending to the sea, have again entered fresh water while still bearing traces of their previous fresh-water life. Examples of these so-called bull trout are to be found in many rivers. They are often of large size, and their flesh is inferior to that of the salmon ascending to fresh water for the first time. They are not very numerous, because the salmon is an infrequent spawner, and commonly remains for one, two, or three years in the sea without entering fresh water. The great majority of salmon found in our rivers are on their first ascent from the sea. The name bull trout is also, and more loosely, given to fresh-water trout of large size and poor shape—fish which inhabit waters where food is not sufficient to fully nourish them. Under these circumstances the head appears unduly large; hence the name. See SALMON, TROUT.

Bülow, PRINCE BERNHARD HEINRICH KARL MARTIN VON (b. 1849), German Chancellor (1900-9), son of the foreign minister Bernhard Ernst von Bülow, was born at Klein-Flottbeck, Holstein. He entered the Foreign Office in 1873, held many diplomatic posts, and became minister to Rumania (1888), ambassador to Italy (1893). As Foreign Secretary (1897) he added the Caroline, Pelew, Ladrone, and Samoan Islands to Germany (1899). He resigned the chancellorship on the defeat of the Inheritance Tax Bill. He was made count in 1899, prince in 1905. Again ambassador at Rome, he sought in vain to keep Italy out of the Great War.

Bülow, FRIEDRICH WILHELM, BARON VON, Prussian general, was born in 1755, and entered the army young. When Prussia declared war with France in 1813, it was Bülow that commanded in the first successful encounter with the French at Möckern, and revived the self-confidence of the army after the adverse battle of Lützen. His victories over Oudinot and Ney at Grossbeeren and Dennewitz saved Berlin, and inflicted severe loss on the enemy. He acted a conspicuous part in the battle of Leipzig, and, by taking possession of Montmartre, finished the campaign of 1814. The king acknowledged his services by an estate worth £30,000, and the title of Count of Dennewitz. In the campaign of 1815 he joined Blücher by forced marches, and headed the column that first came to the aid of Wellington at Waterloo. He died at Königsberg, 25th February 1816.

Bülow, HANS GUIDO VON, pianist, conductor,

and composer, was born at Dresden, 8th January 1830, the son of Karl Eduard von Bülow (1803-53), poet and author. He studied music with zeal, and after being sent to Leipzig and Berlin to qualify for a legal career, resolved to give himself to music. Having spent some time with Richard Wagner, he became in 1857 the pupil of Liszt, whose daughter Cosima, afterwards wife of Wagner (q.v.), he married. In 1854 he became Prussian court-pianist, in 1864 pianist to the Bavarian court, and head of a music-school at Munich. In 1869 family troubles led him to resign his appointments and retire to Florence, and subsequently he undertook great concert tours in England and America. In 1880 he settled as director of music to the court at Meiningen; and after a year in a lunatic asylum, he died 13th February 1894. One of the most brilliant pianists of his time, he was famous as a concert director, and as a representative of the Liszt-Wagner school, he produced works for piano and for the orchestra.

Bülow, KARL VON (1846-1921), German field-marshal, served with distinction in the Franco-German war. In the Great War he was blamed for the failure of the advance on Paris. See his *Mein Bericht zur Marneschlacht* (1920).

Bulrush, a name given to two distinct marsh plants of tolerably similar vegetative habit—*Typha latifolia* and *Scirpus lacustris*. The former

many countries for thatching and fuel, the leaves for mats, chair-bottoms, packing, &c. The woolly fruiting heads are also used as packing material, and in combination with feathers to stuff beds. Typha fibre was much used in Germany as a substitute for wool during the Great War.

The other and apparently rightful claimant of the name bulrush belongs to the Cyperaceæ. There are about 50 species of *Scirpus*, widely distributed through all climates, and applied to almost identical uses with the preceding where they sufficiently abound. It is easily recognised by its compound umbel-like (but probably cymose) heads of spikelets. One species, *S. tuberosus*, is cultivated in India as a source of starch. The common British species may reach a height of 8 feet, and like *Typha* grows in vast swamp jungles along the margins of lakes and slow-running streams, to which they impart a characteristic picturesqueness. *S. maritimus* grows extensively along the shores of the Baltic.

Bulsar, a seaport of India, 115 miles N. of Bombay. Timber is the staple export. Pop. 16,000.

Bultfontein, a diamond mine near Kimberley (q.v.). See CAPE OF GOOD HOPE.—There is another Bultfontein in the Orange Free State, 90 miles ENE. of Kimberley; pop. 800.

Bulti, the northern part of Kashmir (q.v.).

Bul-tso ('Borax Lake') is a lake of Tibet, 100 miles NW. of Lhasa. Its area is 24 sq. m.

Buluwayo. See BULAWAYO.

Bulwer, HENRY LYTTON (1801-72), diplomatist and author, was an elder brother of Lord Lytton (q.v.), and was attached successively to the British embassy at Berlin, Brussels, and the Hague. In 1830 he was returned to parliament, and during the following seven years represented, as an advanced Liberal, the constituencies of Wilton, Coventry, and Marylebone. In 1837 he became secretary of embassy at Constantinople, where he negotiated and concluded a very important commercial treaty. In 1843 he was made minister plenipotentiary to the court of Madrid, and, as arbitrator, negotiated the peace between Spain and Morocco in the following year. His firmness and candour offended Narvaez, the Spanish marshal-dictator, who, pretending to have discovered Bulwer's complicity in certain plots, ordered him to leave Madrid. The House of Commons indorsed the whole course of his conduct, and he was made a K.C.B. in 1848, a G.C.B. in 1851. In 1849 he proceeded to Washington, where he concluded the Clayton-Bulwer Treaty (q.v.); in 1852 to Florence, and in 1856 to Bucharest. From 1858 to 1865 he was ambassador to the Ottoman Porte, and as successor to Lord Stratford de Redcliffe, ably carried out Palmerston's policy on the Eastern Question. In 1871 he exchanged the familiar title, Sir Henry Bulwer, for that of Lord Dalling and Bulwer. He died at Naples, 23d May 1872. Among his works were *An Autumn in Greece* (1826); *France, Social, Literary, and Political* (1834-36); a *Life of Byron* (1835); *Historical Characters* (1868-70); and an unfinished *Life of Palmerston* (1870-74).

Bulwer Lytton, SIR EDWARD. See LYTTON.

Bumboat, a boat employed to carry provisions and other articles from harbours and ports to vessels lying at some distance from the shore. Boats of this kind belong to a class of petty traders, who in England are, for the most part, women.

Bumelia. See BULLET-TREE, SAPOTACEÆ.

Bummaloti. See BOMBAY DUCK.

Bunbury, HENRY WILLIAM, caricaturist, was the son of the Rev. Sir William Bunbury, and was



Bulrush:

A, Common Cat's-tail (*Typha latifolia*); B, Common Bulrush (*Scirpus lacustris*).

of these, also called Reed-mace or Cat's-tail, belongs to the Typhaceæ; it is a large handsome plant of grass-like habit, and reaching a height of 5 to 7 or 8 feet. The characteristic long flowering heads bear the male above the female flowers, although other species are dioecious. The cloud of pollen is collected to adulterate the Lycopodium (q.v.) of pharmacy; the rhizome is astringent, but contains starch used by the Kalmucks; and the shoots of this and allied species are eaten by the Don Cossacks, and hence are sometimes called Cossack Asparagus. The stems of bulrushes are used in

born at Mildenhall in Suffolk in 1750. Educated at Westminster and Cambridge, he early became distinguished for his humorous designs, which gave him the right to rank after Rowlandson and Gillray. He usually avoided political subjects. He drew mainly in pencil and chalks, but also produced water-colours. He died in 1811. His son, Sir Henry Edward Bunbury, seventh Bart. (1778-1860), wrote several historical works, including one on the Peninsular war.

Buncrana, a watering-place on Lough Swilly, 12 miles NW. of Londonderry by rail; pop. 2000.

Bundaberg, a port of Queensland, at the mouth of the Burnett River, and 272 miles N. of Brisbane by rail, in a great sugar district. It was destroyed by a flood in February 1893. Pop. 10,000.

Bundehesh is the name of a Pehlevi book which is an authority on Zoroastrianism. See ZEND.

Bundelkhand, a region of Upper India, between the rivers Chambal and Jumna. It includes districts belonging to the United Provinces of Agra and Oudh (Banda, Jalaun, Jhansi, Lalitpur, and Hamirpur), and also the 'Bundelkhand Agency,' a subdivision of the Central India Agency, which is a group of some 30 native states and petty jaghirs under native princes. The name is now most usually employed for the agency merely, which extends over an area of 10,000 sq. m., with a collective population of 1,750,000. Notwithstanding that the region in the wider sense is well watered, the climate renders irrigation indispensable; and it is accordingly intersected by artificial dams and a canal. It possesses deposits of iron ore, diamonds (in Panna), and copper, but the produce is almost solely agricultural. The principal towns of Bundelkhand are Kalpi, Jhansi, Kalinjar, Banda, Jalaun, Chhatarpur, and Datia.

Bundi, a native state of Rajputana, lying between Jaipur, Tonk, Kotah, and Udaipur. It is traversed from SW. to NE. by a double range of hills, has large tracts of woodland, and is drained by the river Mej. Area, 2220 sq. m.; pop. (1891) 295,675; (1921) 187,068, the decrease owing to the effects of famine. The inhabitants are nearly all Hindus. The chief town, Bundi, contains 425 temples and shrines.

Bundoran, a watering-place on Donegal Bay, 4 miles SW. of Ballyshannon; pop. 2100.

Bungalow, the species of house usually occupied by Europeans in the interior of India, and commonly provided for officers' quarters in cantonments. Bungalows are properly of only one story, with a veranda, and a pyramidal roof, generally of thatch, although tiles are sometimes substituted; houses of masonry, with terraced roofs, are distinguished as *pukka houses*. The name is a corruption of the native word *Banglā*, 'Bengalese,' and probably refers to the first district where the form of building was noticed by Europeans.—*Dāk-bungalows* are houses for travellers, still to a reduced extent maintained by government, where bed, table, and bathroom are provided, and food can be had at a moderate cost. One rupee eight annas a day is charged for the use of these bungalows, which are found on the main routes every 10-15 miles, and on the less-frequented roads at intervals of 40-50 miles.

Bungay, an urban district of Suffolk, on the Waveney, 6 miles W. of Beccles. It grew up around the 12th-century castle of the Bigods, Earls of Norfolk, some ruins of which still remain; but mostly it is later than the great fire of 1688. It has a large printing establishment, and carries on a considerable trade in corn, malt, flour, coal, and lime. Pop. 3000.

Bungener, LOUIS FELIX, Protestant writer, born at Marseilles, of German family, in 1814, studied theology at Geneva, and became director of the gymnasium there in 1843, but was removed by the new Radical government in 1848. Engaging in literature, he published a series of writings on theological and historical subjects, but is most widely known for several works, in the form of romances, in which the principles of Protestantism are set forth and defended. He died 14th June 1874.

Bunias, a small genus of Cruciferae. The leaves of *B. orientalis* are eaten in Russia, and are cultivated in Western Europe as a fodder-plant. The leaves and root of *B. erucago* are eaten in Greece.

Bunion is a term applied in Surgery to enlarged bursæ, or synovial sacs, situated on any part of the foot; but most common over the metatarso-phalangeal joint of the first or the fifth toe (see FOOT), and accompanied by more or less distortion of the joint. In the great majority of cases, bunions are directly produced by the pressure of badly-fitting boots; and if the boots are constructed of patent leather, or any material which stops the excreting action of the skin, this, too, may be regarded as an indirect cause of their formation. Sometimes, however, the tendency to suffer from bunions is hereditary, and almost irremediable. A bunion begins as a painful and tender spot at some point exposed to pressure; the part gradually enlarges, and there are indications of an effusion into a natural bursa or a newly-formed sac. The progress of the affection may stop here, the enlarged bursa remaining, and serving to protect the subjacent parts from pressure; but far more frequently the bunion undergoes repeated attacks of inflammation, causing further increase in size; or becomes the seat of corns or of suppuration. The last action may be followed either by obliteration of the cyst and a cure; or, especially in persons of languid circulation, by a troublesome form of ulcer. The one great thing, when there is a tendency to bunions, is the wearing of roomy boots or shoes, of soft and pervious material, and so shaped as not to press upon susceptible points. When pain occurs, wet lint covered with waterproof material, or poultices, should be applied, at all events at night. Enlargement may sometimes be reduced in its earlier stages by the application of iodine or a mercurial ointment. Where suppuration takes place, the sac should at once be laid freely open. The disease sometimes proves so troublesome that amputation of the toe, or excision of the ends of the bones affected, has been resorted to.

Bunker Hill, an elevation (112 feet) on the peninsula of Charlestown, now part of Boston, Massachusetts, connected by a ridge, 700 yards long, with Breed's Hill (75 feet). The two heights were the scene of the first hard-fought battle of the American Revolution (June 17, 1775), in which the Americans, from behind some works hurriedly constructed during the preceding night, repulsed two attacks by General Gage's forces, and were dislodged only after reinforcements had been brought up, and their ammunition was spent. The British loss was 1054, that of the Americans 449. A granite obelisk, 221 feet high, marks the site of the redoubt. See UNITED STATES.

Bunkum, a phrase used in the United States for mere bombastic speech-making, intended for the newspapers rather than to persuade the audience, and derived from a county named Buncombe in North Carolina. Most authorities agree that the proverbial use is to be referred to the congress of 1819-21, when, according to Wheeler's *History of North Carolina*, 'the member for this district

arose to address the house, without any extraordinary powers in manner or matter to interest the audience. Many members left the hall. Very naively he told those who remained that they might go too: he should speak for some time, but he "was only talking for Buncombe."

Bunn, ALFRED (1796-1860), was in 1833-40 manager both of Covent Garden and Drury Lane Theatres, brought out the chief of Balfe's operas, and wrote or translated most of his libretti (see BALFE). 'Poet Bunn' is best known by his songs in these; but he wrote many 'occasional verses.'

Bunsen, CHRISTIAN KARL JOSIAS, BARON, the distinguished German diplomatist and scholar, was born 25th August 1791, at Korbach, in the principality of Waldeck, and studied at Marburg, Göttingen, Copenhagen, and Berlin. In 1816 he went to Paris, and studied Persian and Arabic under Silvestre de Sacy, and in the same year to Rome, where he married Frances Waddington (1817), and was appointed (1818) secretary to the Prussian embassy on the recommendation of Niebuhr, then Prussian ambassador. On Niebuhr's departure from Rome (1824), Bunsen, who during Friedrich-Wilhelm III.'s visit to Rome in 1822 had gained the king's favour by the frank expression of his views on the Prussian ritual and hymn-book question, conducted the embassy provisionally for a time, and was appointed resident minister in 1827. Bunsen employed the years of his Roman sojourn partly in the study of Plato and the constitutions of antiquity; and still more in biblical inquiries, Egyptology, and researches into the history of the Christian church and its liturgies. He contributed largely to the *Beschreibung der Stadt Rom* (3 vols. Stutt. 1830-43), and wrote the explanatory text to the volume of engravings *Die Basiliken des Christlichen Roms* (Munich, 1843). The Archæological Institute, established at Rome in 1828, found in Bunsen its most active supporter, and it was at his instance that Lepsius obtained from the Prussian government the means for his expedition to Egypt in 1842. He founded a Protestant hospital on the Tarpeian Rock, and with the help of Richard Rothe, then chaplain to the embassy, introduced into the services there a remodelled liturgy, the most part of which was afterwards embodied in his anonymous *Gesang- und Gebetbuch zum Kirchen- und Hausgebrauch* (1846), which has found very great favour in Germany. Becoming involved in the question of mixed marriages, and in the disputes between the Prussian government and the Archbishop of Cologne, he saw his position as Prussian ambassador at the papal court compromised, and, being recalled from Rome in 1838, he was appointed in 1839 Prussian ambassador at Bern. In 1841 he was sent on a special mission to London, to negotiate the erection of an Anglo-Prussian bishopric in Jerusalem, and in the next year was appointed ambassador at the English court. On a visit to Berlin in 1844, he represented the urgency for a deliberative assembly, and also made a complete plan of a constitution for Prussia closely resembling the English. In the Sleswick-Holstein question, Bunsen strongly advocated the German view, in opposition to Denmark, and protested against the London protocol of 1850, but was obliged to sign the treaty of 1852. His views regarding the part that Prussia should act in the Eastern question not being in accordance with those of his court, he ceased in 1854 to represent Prussia at the court of England, and retired to Heidelberg. In 1857 he was created a baron, with a seat in the Prussian Upper House. The last two winters of his life were spent at Cannes, and, settling at Bonn in 1860, he died there on the 28th November of that year.

Arnold accounted it a privilege to sit at Bunsen's

feet, and to Thirlwall, Hare, and Whewell, Bunsen (who had a hearty sympathy with England and Englishmen) was a hero. He was all his life an ardent student, and all his investigations tended to the one aim which he set before himself at the beginning of his career—"the knowledge of God in man, especially in language and religion." His eager desire for positive results and his lively imagination led him in many cases to form premature conclusions, and the fresh impulse which he gave to the studies of others has been a still greater service to religion and science than his own researches. His chief works are: *Die Verfassung der Kirche der Zukunft* (1845; Eng. ed. *The Constitution of the Church of the Future*, 1847); *Die drei ächten und die vier unächtigen Briefe des Ignatius von Antiochien*, and *Ignatius von Antiochien und seine Zeit* (Hamb. 1847); *Aegyptens Stelle in der Weltgeschichte* (6 vols. 1844-57), of which the English edition (1847-67), with many additions by Bunsen and Samuel Birch, is the more valuable; *Hippolytus and his Age* (2 vols. 1852), which was specially written for English readers, and in its second edition formed part of the extensive work, *Christianity and Mankind* (7 vols. 1854), including 3 vols. of *Analecta Ante-Nicæna*, with contributions by Lagarde and other scholars, and *Outlines of the Philosophy of Universal History as applied to Language and Religion* (2 vols.), with contributions by Aufrecht and Max Müller; *Die Zeichen der Zeit* (2 vols. Leip. 1855; Eng. trans. by Susanna Winkworth); *Gott in der Geschichte* (3 vols. Leip. 1857-58); and the *Bibelwerk für die Gemeinde*, completed by Kamphausen and Holtzmann in 9 vols. (1858-70). See Bunsen's *Memoir* (2 vols. 1868) by his widow, Frances Waddington (1791-1876), and her own *Life and Letters* by Hare (2 vols. 1879). His correspondence with Friedrich-Wilhelm IV. was published by Ranke in 1873. His five sons were Heinrich (1818-85), rector of Donington, Shropshire; Ernst (1819-1903), author of *Bible Chronology* and other works; Georg (1824-96), Prussian statesman; and the diplomatists, Karl (1821-87) and Theodor (1832-92).

Bunsen, ROBERT WILHELM, a distinguished German chemist, born at Göttingen, March 31, 1811. He began the study of zoology, chemistry, and physics at the university of his native town, and continued them at Paris, Berlin, and Vienna. After having lectured at Göttingen and Cassel, he filled the chair of chemistry in succession at Marburg, Breslau, and, from 1852, Heidelberg. His papers on physics and geology, as well as on chemistry, are numerous. The charcoal pile and the burner which bear his name are in extensive use. That the hydrate of oxide of iron is an antidote to arsenic, is an important fact which was made known by him, along with his friend Berthold, in 1837. Bunsen was the first to produce magnesium in large quantities; and in 1860 he invented the magnesium light, which has proved so important to photography. But the greatest discovery with which his name is associated, is that of the spectrum analysis—made in conjunction with his friend Kirchhoff—which has been the means of working so many wonders in chemistry, and revealing so much to astronomers. Its first result was the discovery of two new metals. Besides his original work in chemistry, Bunsen proved himself also one of its most successful teachers, with a singularly happy manner of demonstration. Among his works are: *Enumeratio ac Descriptio Hygrometrorum* (1830), *Das Eisenoxydhydrat* (2d ed. 1837), *Gasometrische Methoden* (1857; English by Roscoe), *Einleitung zur Analyse der Aschen u. Mineralwässer* (1874), and *Flammenreaktionen* (1880). The government of Baden made him a privy-councillor in 1863. He died 16th August 1899. See *Nature* for 1881, 1899.

Bunsen Burner. Probably no invention has done so much to facilitate work in the chemical laboratory as that of the Bunsen burner, so named after the distinguished chemist. Prior to its introduction, the heating by gas or oil had been unsatisfactory, owing to the imperfect combustion of the carbon causing the deposit of soot on any body in contact with the flame. Applying the principle of the Blowpipe (q.v.), a plentiful supply of air was caused to mingle with the gas before ignition, so that a smokeless flame of low luminosity but great heating power was the result. The Bunsen burner



Bunsen Burner.

has undergone many changes, by which it has been adapted to the various requirements of domestic life, but through all, the essential principle remains the same. The simplest form consists of an ordinary gas-jet, over which is placed a piece of metal tube, 4 to 6 inches long, and perforated with holes at the bottom. The gas having been turned on, air rushes in at the holes, so that when a light is applied to the upper end of the tube, a greenish-blue flame is obtained. If the air is in excess, the flame inclines to green; if deficient, a yellow flame results. The great objection to this, the original form, lies in its tendency to *burn back*, if the gas pressure be but small. When this occurs, and the flame burns at the jet, before it mixes with the extra volume of air, a long smoky flame issues from the tube, while the disagreeable odour of acetylene, C_2H_2 , a product of the imperfect combustion of coal-gas, at once becomes apparent. To remedy this drawback, wire-gauze, through which flame cannot pass, is sometimes placed over the aperture, forming a 'solid flame' burner, or the mixture of gas and air is allowed to issue through small holes or narrow slits. For cooking, heating, ironing, soldering, &c., the value of the Bunsen burner is well known. The ordinary incandescent gas burner is another example. A mantle of special material is fixed in the hot part of the flame, the heat being sufficient to raise it to incandescence.

Bunt, a parasitic disease of cereals, due to *Tilletia caries*, a mould belonging to the Ustilaginæ. See SMUT, PLANTS (DISEASES OF).

Bunter Sandstein, or 'variegated sandstone,' is the lowest member of the Triassic system. As the Trias is more perfectly developed in Germany than in Britain, the German beds are considered the typical group of this system. The bunter sandstein consists of various coloured sandstones, interstratified with red marls and thin beds of limestone, which occasionally, as in the Harz, are oolitic, but in other places dolomitic. They attain a maximum thickness of 1500 feet. The English representatives of the bunter sandstein are chiefly developed in Lancashire and Cheshire, and consist of red and mottled sandstones with beds of marl, and thick rather irregular bands of partially consolidated conglomerate called 'pebble beds.' Many species of fossil plants have been found in the bunter sandstein of Germany, consisting chiefly of ferns, cycads, and conifers. The English bunter sandstein, however, is for the most part unfossiliferous, an equisetum, one or two ferns, and a few

conifers being all the plants yet met with. But the most remarkable fossils in this formation are the remains of huge amphibians. Originally, the footprints which had been left by the animals on the moist sand were alone observed. From their resemblance to the impressions made by a human hand, the animal producing them was provisionally named *Cheirotherium* (q.v.). The subsequent discovery and examination of the remains of teeth and bones in the same beds have afforded sufficient materials to enable Owen to reconstruct an animal named by him *Labyrinthodon* (q.v.), which undoubtedly produced the footprints. (More recently these footprints have been assigned to more than one form of labyrinthodon.) These remains have been detected in Lancashire and Cheshire, as well as in Germany.

Bunting, JABEZ, Wesleyan minister, was born at Manchester in 1779, and in 1799 entered the ministry, in which he was very successful. He was president of the conference in 1820, and again in 1828, 1836, 1844. In 1835 he was chosen president of the Wesleyan Theological Institute, and he acted as second secretary to the Wesleyan Missionary Society for upwards of twenty years. He was the chief authority in all matters relating to the government and polity of Wesleyan Methodism. He died 16th June 1858. See his Life by his son (1887).

Bunting (*Emberiza*), a genus of birds in the great finch family Fringillidæ. They are nearly allied to the crossbills. The most marked characteristics are a short, straight, conical bill; a curved form of the gape, produced by a narrowing of the sides of the upper jaw, and a corresponding enlargement of the under one; and a hard rounded knob on the palate or inner surface of the upper jaw. This knob probably aids in crushing the seeds, which are a principal part of the food of these birds. The species of bunting are numerous, and may be arranged in several sub-genera.—The Common Bunting, or Corn Bunting (*E. miliaria*), is a bird considerably larger than a house-sparrow, brown, with darker streaks on the upper parts, whitish brown with spots and lines of dark brown on the under parts, and with a slightly forked tail. It is frequent, particularly in low cultivated grounds in Britain, and in most parts of Europe, extending also into Asia, living in pairs during spring and summer, but in flocks in winter, and often visiting barn-yards at that

Reed Bunting (*Emberiza schoeniclus*).

season, along with chaffinches and sparrows. It is the largest of the British buntings. It is supposed that the winter flocks in Britain are much increased by migration from more northerly regions. This bunting often passes the night on

the ground in stubble-fields, and is taken in the nets employed for catching larks, and brought with them to market. It usually builds its nest on or very near the ground. Its notes are harsh and unmusical, and sometimes sound like the clicking of knitting needles.—The Reed Bunting, or Black-headed Bunting (*E. schoeniclus*), is a species common in marshy situations, both in Britain and on the continent of Europe. It feeds much on willow and other buds. It is a very pretty little bird, in the male with black head, cheeks, and upper throat; in the female with brown instead of black, and with a white throat.—The Cirl Bunting (*E. cirius*), of which the head is olive-green, with black streaks, and with patches of bright lemon-yellow on the cheeks and over the eyes, is a rare British bird, and belongs chiefly to the south of Europe and the north of Africa. To this genus belong also the Ortolan (*E. hortulanus*, q.v.), and the Yellow-hammer (*E. citrinella*, q.v.).—The Snow Bunting (q.v.), or Snowflake (*E. nivalis* of many authors), has been placed in the new genus *Plectrophanes*. The name bunting has been often very vaguely used, and many species have been almost indiscriminately called buntings or finches. The palatal knob affords the best distinctive character. North America has a large number of species of bunting.—The Black-throated Bunting (*E. americana*) is extremely plentiful on the prairies of Texas and other south-western parts of the United States; extending, however, as far as to Ohio, and even to Massachusetts. In the middle and northern states it occurs only as a summer bird of passage. In its habits it closely resembles the Common Bunting of Europe; but the palatal knob is less hard. See Macgillivray's *British Birds*, vol. i.

Bunting, or BUNTINE, is a thin woollen material of which the flags and signals of ships are usually made.

Bunyan, JOHN, author of the *Pilgrim's Progress*, was born at Elstow, near Bedford, in 1628. His father describes himself in his will, the original of which is still in existence, as a 'braseyer,' and is ordinarily spoken of as a tinker, in which craft his eldest son John was duly trained. Sir Walter Scott, in the *Quarterly Review* of 1830, started the idea that, as Gypsies were frequently tinkers, Bunyan may have belonged to the Gypsy race. Recent researches, however, have shown that there is no historical basis for the suggestion. The name originally took the form Buington, and the family were certainly in Bedfordshire in 1199, if not earlier. There is also documentary evidence connecting them with the identical spot where Bunyan was born, in the east fields of Elstow, as early as 1327. From the Court Roll of the manor of Elstow we find that Thomas Bonyon did fealty and suit of court for his cottage and nine acres of land to the lord of the manor in 1542 and on to 1550. In a minute of the Privy-council he is described as 'Bonyon, victualler,' and in the Court Roll of the manor as a 'common brewer of beer' and as a 'common baker of human bread.' He probably kept a little roadside inn in his cottage on the bridle-road between Bedford and Wilstead. The place where he lived is also described in the same record as 'Bonyon's End,' that is, the end or extremity of the parish where the Bunyans lived. This is the name which it had evidently borne for a long time previously, and it is the name by which that part of Elstow has continued to be known down to our own day. The grandson of this Thomas Bonyon, who was Bunyan's grandfather, describes himself in his will as a 'pettie chapman,' or small village trader. According to the transcript registers from the parish of Elstow, Bunyan's father married Margaret

Bentley on the 23d May 1627, and on the 30th November 1628 their illustrious son was baptised at Elstow Church. When he was in his sixteenth year his mother and his sister Margaret died within a month of each other; and the following year Bunyan, probably under the action of a levy made by parliament upon the villages of Bedfordshire, was drafted into the army, and took part in the civil war between Roundhead and Royalist. Probably not for long, however, as he did not reach the army regulation age of sixteen till November 1644, and in June 1645 the battle of Naseby practically put an end to the war. On the disbanding of the army, Bunyan returned to Elstow, and about 1649 married a wife who brought him no dower of worldly wealth, for, says he, 'this woman and I came together as poor as poor might be, not having so much household stuff as a dish or spoon betwixt us both.' She brought with her, however, two books which had belonged to her father, the *Plain Man's Pathway to Heaven*, and the *Practice of Piety*, in which they read together, and by which Bunyan was considerably influenced. His *Life and Death of Mr Badman*, which he published in 1680, shows not a little resemblance to the first of these books. During these early days of his wedded life, he lived in the cottage at the entrance of the village of Elstow, now known as Bunyan's cottage, the house in which he was born being in the fields about a mile to the east. It was while living here that his blind child was born, and that he took such pleasure in ringing the bells in the tower of Elstow Church. It was here also that he began to pass through those deep religious experiences which he has described so vividly in his *Grace Abounding*.

During this time he was introduced by some good people at Bedford to their minister, John Gifford, a converted royalist major who had organised a little community, sometimes incorrectly described as a Baptist church, it being a church in which baptism and some other questions much debated in those days were left to the individual conscience, and not made an essential part of church life. Bunyan joined this Christian fellowship in 1653, and about 1655 he was asked by the brethren to address them in their church gatherings. This led to his beginning to preach in the villages round Bedford, and in 1656 he was brought into discussions with the followers of George Fox, which issued in his appearance as an author, his first book, *Some Gospel Truths Opened*, being published against the Quakers in 1656. This earliest effort of his pen, though rapidly written, is a vigorous production, and altogether remarkable as the composition of a working-man whose school-days had become a far-off memory. To this Edward Burrough, an eminent Quaker, replied, and Bunyan gave rejoinder in *A Vindication of Gospel Truths Opened*. Two other works were published by him, after which, in the month of November 1660, he was arrested while preaching in a farmhouse at Samsell, a little hamlet a few miles south of Ampt-hill. The imprisonment which followed upon this arrest lasted for twelve long years, during which Bunyan wrote *Profitable Meditations, Praying in the Spirit, Christian Behaviour, The Holy City, The Resurrection of the Dead, Grace Abounding*, and some smaller works. This imprisonment was in the county gaol, which stood at the corner of the High Street and Silver Street, in the centre of the town of Bedford. Bunyan was released after the Declaration of Indulgence of 1672, under which he became a licensed preacher, having been chosen by the church to which he belonged as their pastor. He had occupied this position for three years, when in the month of February 1675 the Declaration of Indulgence was cancelled, and the licenses of the

Nonconformist preachers recalled by proclamation. The following month, March 4, a warrant, signed by no fewer than thirteen magistrates, and sealed by ten out of the thirteen, was issued for his arrest. This warrant turns out to have been preserved among the Chauncy MSS., and came to light in July 1887 when these were brought to the hammer at Messrs Sotheby's. Brought to trial at the midsummer sessions under the Conventicle Act, Bunyan was sent to prison for six months in the town gaol on Bedford Bridge. It was during this later and briefer imprisonment, and not during the twelve years in the county gaol, that he wrote the first part of his memorable work, the *Pilgrim's Progress*. This was entered in the register of the Stationers' Company, 22d December 1677, and in a contemporary catalogue of books appears as licensed February 18, 1678. When first issued it was shorter than it afterwards became. It then contained no Mr Worldly Wiseman, and no second meeting with Evangelist. The discourse with Charity at the Palace Beautiful, the further accounts of Mr By-ends rich relations, the story of Diffidence, the wife of Giant Despair, and various other passages, were added afterwards in the second and third editions, which appeared in the autumn of 1678 and the early part of 1679. This was followed by the *Life and Death of Mr Badman* in 1680; by the *Holy War*, his most memorable work after the *Pilgrim's Progress*, in 1682; and by the second part of the *Pilgrim*, containing the story of Christiana and her children, in 1684. Bunyan had been pastor of the Bedford Church for sixteen years, when, after a ride through the rain on horseback from Reading to London, he was seized with a fatal illness at the house of his friend, John Strudwick, a grocer at the sign of the Star on Snow Hill, Holborn, and here he died on the 31st August 1688, and was buried in the *Campo Santo* of the Nonconformists in Bunhill Fields.

During the sixty years of his life, Bunyan wrote something like sixty books, but he will be best remembered by three of these—the *Grace Abounding*, the *Holy War*, and the *Pilgrim's Progress*, and best of all by the last of the three. The *Pilgrim's Progress* sprang at once into fame, 100,000 copies being sold during the subsequent ten years of its author's life. It was also printed at Boston, in New England, in 1681, and a Dutch translation was issued by Joannes Boekholt of Amsterdam in 1682. This last and a subsequent edition of a superior character, issued in 1685, were illustrated by Dutch engravers, then the leaders of the art of engraving in Europe. The book was also translated into Welsh, Walloon French, German, Polish, and Swedish, between 1688 and 1743. Since then it has been translated into no fewer than eighty-four languages and dialects, the versions in Japanese and the Canton vernacular being admirably illustrated by native artists, who have adapted the scenery and costumes to those of their own country. Traces of the influence of the work upon Schiller have been pointed out in two poems, 'Der Pilgrim' and 'Die Sehnsucht'; Wieland first learned English from the *Pilgrim's Progress*. Of the first edition six copies of the first part only were known till 1901, when a seventh was sold at Sotheby's for £1475; and there is a complete series of editions down to the thirty-fourth, with the exception of the seventeenth. Since the thirty-fourth no record has been kept, the editions becoming in number numberless. An incomplete folio edition of Bunyan's general works was published in one volume in 1692, and complete editions in two volumes folio were issued in 1736-37, and in 1767. A folio edition in one thick volume of 1112 pages, double columns, was also published in Edinburgh by Henry Galbraith in 1771, and various other collected editions in quarto

and octavo were subsequently issued in England, Scotland, and America.

See the Lives of him by Southey (1830), Offor (1862), Froude (1880), John Brown (1885; new ed. 1888), Venables (1888), and Hale White (1904); and C. K. Wright, *Bunyan as a Man of Letters* (1916).

Bunyip, a fabulous animal resembling a seal, which, according to the Australian natives, lives in swamps and water-holes. Europeans, they say, are unable to see it.

Bunzlau, a town of Prussian Silesia, on the Bober, 25 miles WNW. of Liegnitz by rail, manufactures earthenware, woollens, glass, and hosiery; and there is trade in corn, wool, and cattle. Here Opitz was born. Pop. 15,000.—**JUNG BUNZLAU** (Czech *Mladá Boleslav*) is a town of Bohemia, on the Iser, 32 miles NE. of Prague by rail, manufacturing woollens, starch, spirits, and soap. It was once a centre of the Bohemian Brethren. Pop. 16,000.

Buol-Schauenstein, KARL FERDINAND, COUNT, Austrian statesman, born 17th May 1797, was minister in succession at Karlsruhe, Stuttgart, Turin, and St Petersburg. He was second Austrian plenipotentiary at the Dresden Conference (1850), after which he was minister at London, until the death of Schwarzenberg recalled him to Vienna, to hold the portfolio of foreign affairs. He presided at the Vienna Conference in 1855, and represented Austria at the Congress of Paris. He died October 28, 1865.

Buonaparte. See BONAPARTE.

Buonarroti. See MICHELANGELO.

Buondelmonti. See FLORENCE.

Buononcini, or BONONCINI, GIOVANNI MARIA (1640-78), wrote instrumental pieces, songs, and church music. His sons, Marc Antonio (1660-1726) and Giovanni Battista (1672-1750), were known as composers of operas. The latter settled in London in 1720, and for some years was a very popular rival to Handel (q.v.).

Buoy is a floating mark placed in the navigable track of vessels to indicate the existence of a sunken danger. They are made of various shapes and colours so as to indicate on which hand vessels must keep them in passing. A conference of the nautical authorities of Great Britain resolved in 1883 to adopt a uniform scheme of buoyage. The principal features of this scheme were that buoys showing the apex of a cone above water should be known as conical buoys, and should always be starboard-hand buoys; buoys showing a flat top above water should be called can buoys, and should be port-hand buoys; and buoys showing a domed top above water should be called spherical, and should mark the ends of middle grounds. In addition, port-hand buoys in Scotland must be painted black, and starboard-hand buoys red. Spherical buoys are distinguished by white stripes. The starboard buoys are on the right hand when the vessel is ascending a river, and on the coast the starboard buoy is on the right hand when the vessel is going with the main stream of flood-tide. Wreck buoys are painted green, and are marked 'Wreck.'

The Courtenay buoy is conoidal, and is surmounted by a large deep-toned whistle. From the lower end a large tube descends about 30 feet, where the water is not much affected by the surface undulation, and the surface of the water inside this tube stands at the mean level of the ocean, while the buoy rises and falls by the swell of the sea. There is accordingly an alternate inhaling and exhaling of air, which impinges on the edge of the whistle and produces a deep loud sound, heard in favourable circumstances five miles away. The bell buoy is formed as a large segment of a sphere, the flat side being uppermost. On this is erected a

framework which carries a bell of 3 to 7 cwt. The bell is a fixture, and is rung by the swinging of movable clappers, or by cast-iron balls guided to roll against the lip of the bell. It is not nearly so efficacious as the Courtenay buoy.

Lighted Buoys.—River buoys are in many cases lighted by compressed oil-gas on Pintsch's principle, and the buoy is charged to a pressure of about seven atmospheres. The buoy is surmounted by a small dioptric apparatus in which the light burns constantly, or can be made to flash. The buoys are charged every two or three months according to their capacities, and their gas reservoirs are filled in a few minutes by means of a hose leading from tanks on the supply steamer. The Clyde Lighthouses Trustees were the first (in 1880) to introduce these buoys, and soon thereafter were followed by the Thames, where in 1538 ordinary buoys were first used as an indication to pilots. In special cases electricity has been employed for the lighting of buoys, but acetylene is now largely used, being generated within the buoy and led up to the burner. Sometimes the acetylene is dissolved in acetone, and enclosed in cylinders which can be attached to the buoys. The light is made to flash or occult by means of a valve worked by the flow of the gas. In recent years mantle burners are largely used on buoys.

The Courtenay Automatic Sound-
ing Buoy:

a, cylinder; b, mooring shackles;
c, rudder; d, buoy; e, diaphragm;
f, ball-valves; g, air inlet tubes;
h, outlet tube to whistle; i, com-
pressed-air inlet to buoy; k, man-
hole; l, steps; m, whistle.

For LIFE-BUOY, see that head.

Buoyancy is that quality whereby a ship, or any other floating body, is enabled to support a certain weight. In the case of a ship, it is necessary that such weight should be carried without her sinking too deeply in the water, or floating too lightly on it. The weight of a ship, not loaded with any cargo, is exactly equivalent to the weight of the volume of water she displaces (see HYDROSTATICS). Therefore, given a certain draught-line to which a ship is to be loaded, multiply the number of cubic feet of the volume of the immersed part by the weight of a cubic foot of sea-water (64 lb.), and the product will be the weight of water displaced by the ship at the given draught-line. If from this the weight of the ship herself be subtracted, the residue is the amount of extra weight, or cargo she is capable of carrying at that draught-line, and is a measure of her quality of buoyancy.

Buphaga. See BEEF-EATER.

Buprestis, a genus of beetles, typical of a large family—Buprestidae. Those occurring in warmer countries are conspicuous for lively colour and metallic sheen. Some of them are popularly known as Golden Beetles. *B. gigas*, found in Cayenne, is about 2 inches long. Some small species occur in England. The larvae bore tunnels

in wood. The adults are drawn from their hiding-places among plants by the warmth and brightness of the mid-day sun, with which their own vividness seems so markedly in harmony. The wing-cases of



Buprestis bicolor.



Larva of Buprestis gigas.

some species are used to enrich the embroidery of the Indian zenana, and the joints of the legs are also strung into necklaces and bracelets.

Bur, in an engraving, is a slight ridge of metal raised on the edges of a line by the graver or the dry point. It produces an effect like a smear, and is therefore usually regarded as a defect, and scraped off. Some etchers, however, take advantage of it to deepen their shadows, and Rembrandt made use of it in this way with telling effect. As the bur soon wears off, in valuable old proofs its presence is strong evidence of the early date of an impression.

Bur. See BURDOCK, THISTLE.

Burano, an island and town of northern Italy, 5 miles NE. of Venice. The inhabitants engage in fishing and horticulture. There is a school for the designing and making of fine laces—once a famous local manufacture. Pop. 8000.

Burbage, RICHARD, a great English actor, born about 1567, the son of James Burbage, an actor, who built the 'Theatre,' Shoreditch (1576), and the second Blackfriars Theatre (1596). Richard made his debut in 1583, soon outstripped all competitors, and earned the title of 'Roscius.' The death of his father in 1597 brought him a share in the Blackfriars Theatre, and in 1599, together with his brother Cuthbert, he pulled down the Shoreditch house, and built with the materials the famous Globe Theatre as a summer playhouse, while the Blackfriars was to become exclusively a winter house. For the expenses of building Burbage had to borrow money, and he took as partners Shakespeare, Hemmings, and others. At these two theatres Burbage gained his greatest triumphs, and took the leading part in almost every new play until his death in 1619. Though short and stout in person, he played heroic tragedy with great fire and genius, and Overbury tells us of the modulations of his voice, and his 'full and significant action of body.' Richard III. was one of his most popular parts. Burbage was a not unskilful painter, and an undoubted picture of his is preserved at Dulwich. See Mrs C. C. Stopes, *Burbage and Shakespeare's Stage* (1913).

Burbank, LUTHER, American plant-breeder, born at Lancaster, Mass., in 1849, by indefatigable experiment obtained many new fruits and flowers at Santa Rosa, Cal. See Life by H. S. Williams (1916).

Burbot (*Lota vulgaris*), a fish closely allied to the Ling (q.v.), and remarkable as the only fresh-water species of the Cod family (Gadidae). It is found in the Cam, the Trent, and other rivers of the eastern and midland counties of England, but is one of the most local of British fresh-water fishes. It is found also in various parts of middle

Europe, and in Asia. In English rivers, it often reaches 2 or 3 lb. in weight, but has been taken of 8 lb. weight; and in some parts of Europe, it is said to reach as much as 10 or 12 lb. In appearance, the burbot very much resembles the



Burbot.

ling, but is rather thicker at the neck, and tapers somewhat more rapidly, although still of a somewhat elongated form. It has two dorsal fins, the first short, the second very long, and a very long anal fin. It differs from the ling in the form of the tail-fin, which is oval and slightly pointed; but agrees with it in having a single barbule on the lower jaw. It is of a greenish-brown colour, clouded and spotted with darker brown on the upper parts, the under parts lighter; the scales are small; and the whole body is covered with a mucous secretion. The flesh is white, firm, and of good flavour. The burbot usually keeps to the bottom of deep water, and swims up the river at spawning times (midwinter). It can survive for a long time out of water. It is commonly taken by trimmers and night-lines, as it feeds principally during the night. Its food consists of small fishes, worms, molluscs, fish-spawn, &c. Its liver yields an oil similar to cod-liver oil. It is one of the hosts of the asexual stage of the formidable parasite, *Bothriocephalus* (q.v.).

Burckhardt, JOHN LEWIS, traveller, born at Lausanne, Switzerland, in 1784, was educated at Neuchâtel, Leipzig, and Göttingen. In 1806 he came to London with an introduction from Blumenbach to Sir Joseph Banks, the leading spirit of the African Association, who accepted his services to explore the interior of Africa; and in 1809 he embarked for Malta, having previously qualified himself for the undertaking by a study of Arabic, and also by inuring himself to hunger, thirst, and exposure. From Malta he proceeded, under the disguise of an oriental dress and name, to Aleppo, where he studied more than two years, at the end of which time he had become so proficient in the vulgar Arabic, that he could safely travel in the disguise of an oriental merchant. He visited Palmyra, Damascus, Lebanon, and other remarkable places, and in 1812 went to Cairo, his object being to proceed from thence to Fezzan, and so to the source of the Niger. No opportunity offering itself at the time for that journey, he went into Nubia, and thence in 1814 proceeded to Mecca, one of the very first Christians to perform the pilgrimage. So completely had he acquired the language and ideas of his fellow-pilgrims, that, when some question arose respecting his orthodoxy, he was thoroughly examined in the Koran, and was not only accepted as a true believer, but was highly commended as a great Moslem scholar. In 1815 he returned to Cairo, and in the following year ascended Mount Sinai. The Fezzan caravan, for which he had waited so long, was at last about to depart, and Burckhardt had made all his preparations for accompanying it, when he was carried off by dysentery at Cairo, October 15, 1817. He was buried, as a holy pilgrim, in the Moslem cemetery. His collection of oriental MSS., in 350 volumes, was left to the university of Cambridge. His journals of travel, remarkable alike for their interest and evident truthfulness, were published in 1819-30 by the African Association.

Burdekin, a river of Queensland, draining the district of North Kennedy. It rises in the ranges behind Cardwell, and flows south-east for nearly 300 miles to a junction with the Belyando, which has come an equal distance northwards. The Burdekin then runs north into a delta emptying into Bowling Green and Upstart bays. It was discovered by Leichhardt in 1845, and explored by Dalrymple and Smith in 1859-60.

Burden, a term of law in Scotland, used to signify any restriction, limitation, or encumbrance affecting either person or property. With regard to mere personal burdens, or obligations to pay, no difficulty occurs. But if the payment of a sum of money is intended to make a real burden on land, or to be secured on land which is being conveyed, care must be taken to give the exact sum and the name of the creditor (or by reference to recorded deeds to give the means of ascertaining these), and to state distinctly (although no particular form of words is essential) that the money is to be a burden or charge on the land. Registration of such words in the Register of Sasines is essential to the validity of the burden. The creditor in a real burden can point the movables on the land, and can adjudge the land itself, and thereafter sue the tenants for rent. Real burdens may now be conveyed or extinguished in the same manner as other heritable securities.

Burden of Proof, in legal procedure, signifies the obligation to establish by evidence certain disputed facts; and, as a general rule, this burden lies on the party asserting the affirmative of the issue to be tried or question in dispute, or on the party who would fail if no evidence were adduced on either side. Accordingly, it almost always rests on the plaintiff or pursuer in an action, or on the party asserting the facts on which the result of the litigation must depend. There may, however, be such a legal presumption in favour of the pursuer, that the burden falls on the defender. Thus, where a deed granted by a client in favour of a law-agent is impeached, the law-agent would have to prove that it was properly obtained, and afterwards confirmed by the client. And matters alleged in defence must of course be proved by the defender. Thus, in an action for infringement of patent, it is presumed, unless the defender proves the opposite, that the patent was for an original and meritorious invention. In fact, all the legal presumptions—e.g. in favour of innocence of charges of crime and fraud, in favour of the course of business having been followed, in favour of the onerosity of bills of exchange (i.e. that they were granted for value)—throw the burden of proof on the party contradicting these presumptions. A party is generally bound to prove what is peculiarly within his knowledge. The general presumption in favour of innocence is, in the case of certain statutory offences, displaced by statute for reasons of public policy, the burden being put on the accused of disproving an inference of guilt arising in particular circumstances. This subject is treated by all the writers on Evidence. See also Bentham's *Rationale of Judicial Evidence*.

Burder, GEORGE, Congregationalist minister, was born in London in 1752. He studied for an artist and engraver, but in 1776 began preaching, and in 1778 was appointed pastor at Lancaster. He removed in 1783 to Coventry, and in 1803 to London. Here he became secretary to the London Missionary Society, and editor of the *Evangelical Magazine*. He died 29th May 1832. His *Village Sermons* have been translated into many languages; and he was the author of other series of sermons and publications which have had an immense circulation. See his *Life* by H. Burder (1833).

Burdett, SIR FRANCIS, Bart., the most popular English politician of his time, was born 25th January 1770. Educated at Westminster and Oxford, he spent three years (1790-93) on the Continent, and was a witness of the progress of the French Revolution. In 1793 he married Sophia, youngest daughter of Coutts, the wealthy London banker; in 1796 was elected M.P. for Boroughbridge, Yorkshire, and in 1797 succeeded to the baronetcy. In the House of Commons he made himself conspicuous by his opposition to the war, and his advocacy of parliamentary reform, Catholic emancipation, freedom of speech, prison reform, and other liberal measures, most of which were afterwards carried. One of the most effective political speakers of that excited period, he for many years prominently occupied public attention, and was the idol of the London populace. His candidature for Middlesex in 1802 involved him in four years' costly and fruitless litigation; but in May 1807, in which same month he fought a duel with a Mr Paull, he was returned for Westminster, which he represented till 1837. Burdett having in 1810 published, in Cobbett's *Political Register*, a Letter to his Constituents, declaring the conduct of the House of Commons illegal in imprisoning a radical orator, the Speaker's warrant was issued for his apprehension, as being guilty of a breach of privilege. For two days he barricaded his house; the populace supported him in his resistance, and in a street contest between them and the military one life was lost; but after two days an entry was forced, and Burdett conveyed to the Tower. The prorogation restored him to liberty. In 1820 a letter on the 'Peterloo massacre' involved him in three months' imprisonment and a fine of £1000. In 1835 he joined the Conservatives; in 1837 was returned for Wiltshire, which he represented till his death, on 23d January 1844.

Burdett-Coutts, THE RIGHT HON. ANGELA GEORGINA, BARONESS, daughter of Sir Francis Burdett, was born 21st April 1814. In 1837 she inherited much of the property of her grandfather, Thomas Coutts, the banker, on the death of his widow, Miss Mellon the actress once, now Duchess of St Albans. The liberal and philanthropic use she made of this wealth, in her efforts to mitigate the sufferings of mankind and of the lower animals, rendered her name well known and deservedly popular. Besides spending large sums of money in building and endowing several churches and schools, she endowed the three colonial bishoprics of Cape Town, Adelaide, and British Columbia, founded an establishment in South Australia for the improvement of the aborigines, got up the Turkish Compassionate Fund (1877), and established a fishery school at the Irish village of Baltimore (1887). In her zeal for the good of her own sex, she effected important reforms in the teaching of girls at the National Schools, and established a shelter and reformatory for fallen women. To the city of London she presented, besides several handsome fountains, the Columbia Market, Bethnal Green (1870), for the supply of fish in a poor district; she also built Columbia Square, consisting of model dwellings at low rents, for about 300 families; and the People's Palace owes much to her generosity. A lively interest in emigration led her from time to time to assist many poor families in their passage and outfit. Her private charities were on a corresponding scale. In 1871 she accepted a peerage. She died 30th December 1906. In 1881 she was married to Mr William Ashmead-Bartlett (1851-1921), who in 1882 obtained the royal licence to assume her name, and who, from 1885, was Conservative member for Westminster.

Burdigala, Latin name of Bordeaux (q.v.).

Burdock (*Arctium*), a genus of Composite (q.v.), having the bracts of the involucre hooked inwards at the point. The head, or *bur*, thus readily lays hold of the clothes of a passer-by, the wool of a sheep, or the like, and so the fruitlets are disseminated, the short hairy pappus being insufficient to waft them far on the wind. The Common Burdock (*A. Lappa*) is consequently of wide distribution throughout the north temperate



Greater Burdock (*Arctium Lappa*, var. *majus*):
a, section of flower-head, showing hooked bracts.

zone, and has numerous varieties or sub-species. It is very common in the United States. Introduction into Australia is forbidden by law. It flowers in July and August. The young shoots have been used as a vegetable, for which it has even attained cultivation in Japan.

Burdon-Sanderson, SIR JOHN SCOTT (1828-1905), physiologist, born at Jesmond near Newcastle, studied medicine in Edinburgh. In 1856-83 he held appointments in London, including the physiology chair in University College, and investigated epidemic diseases. He became first Waynflete professor of Physiology (1883) at Oxford, where against fierce anti-vivisectionist opposition he brought success to the medical school; and in 1885 professor of Medicine. He was made president of the British Association (1893) and a baronet (1899). He did distinguished work in biology as well as medicine. See a *Memoir* by Lady Burdon-Sanderson (1911).

Burdwan. See BARDWAN.

Bureaucracy is a type of government in which the administration is centralised in regularly graded series of government officials, who are responsible only to their chiefs, and who interfere with and control every detail of public and private life.

Burford, a small town of Oxfordshire on the Windrush, 17 miles W. by N. of Oxford, is ancient and picturesque. It was the scene of a synod in 705, a West Saxon victory over Mercia in 752. See W. H. Hutton, *Burford Papers* (1906); R. H. Gretton, *The Burford Records* (1920).

Burg, a manufacturing town of Prussian Saxony, on the Ihle Canal, 15 miles N.E. of Magdeburg; pop. 23,000.

Burgage Tenure is the name of two different tenures of land, one in England, the other in Scotland. In England it is a species of free *Socage* (q.v.) holding, and it prevails where the king or other person is lord of an ancient borough in which the tenements are held by a certain and determinate

rent, and subject to a variety of customs, the principal and most remarkable of which is that called *Borough English* (q.v.). Among the other customs was one that the wife shall be endowed with all her husband's tenements, and not with the third part only, as at common law.

In Scotland, by this tenure is meant a peculiar sort of military holding affecting property in royal burghs, the sovereign being superior or overlord, and each individual proprietor or burgess holding direct of the crown, for the *reddendo* or service of *Watching and Warding*. This service is otherwise termed 'service of burgh used and wont,' and is now merely nominal. The proper vassal of the crown is the whole community; hence the tenure was not subject to the incidents of non-entry and relief, and the burgesses enjoyed peculiar facilities in the completion of titles by heirs and purchasers through the intervention of the magistrates. Since the conveyancing legislation of 1868 and 1874, however, there is not for practical purposes much difference between burgage and the ordinary feu-holdings in Scotland. At one time no widow's terce was due from burgage lands, but this was altered by the Conjugal Rights Act, 1861.

Burgas, a port of southern Bulgaria, on the Gulf of Burgas, in the Black Sea, 76 miles NE. of Adrianople. It has a trade in agricultural produce and clay for pipe-making. Pop. 22,000.

Burgdorf (Fr. *Berthoud*), a Swiss town, 14 miles NE. of Bern by rail, with manufactures of silk, linen, and colours. In the old castle here Pestalozzi established his famous school (1798-1804). Pop. 10,000.

Burgenland, a German-speaking district ('German West Hungary') detached from Hungary and assigned to Austria by the Treaty of Trianon (1920). Hungarian bands resisted the carrying out of the treaty, but the territory was handed over in 1921-22, except Oedenburg or Sopron and its neighbourhood. Burgenland then became a 'land' of the Austrian republic. Area, about 1500 sq. m.; pop. 350,000.

Bürger, GOTTFRIED AUGUST, German lyric poet, was born 31st December 1747, at Molmerswende, near Halberstadt, the son of the Lutheran pastor. In boyhood he displayed no inclination to study, and Latin he especially abhorred; but he showed at the same time a relish for verse, though his only model was the hymn-book. He was educated at Aschersleben and Halle, where in 1764 he began to study theology; but in 1768 he migrated to Göttingen, and entered on a course of jurisprudence. His life there was wild and extravagant, and he might have sunk into obscurity if the intimacy which he happily formed with Voss, the two Stolbergs, and others of that youthful poet band had not stirred up his better nature, and inspired him with an ambition to excel. He studied closely the ancient and modern classics; Shakespeare and Percy's *Reliques* had the strongest influence of all. As to his poems, chiefly ballads and songs, even German critics, such as Schiller, Gervinus, and Vilmar, differ widely in their opinions; but all agree in praising the clear, strong versification of *Lenore*, the *Wild Huntsman*, and others of his ballads. As Percy's *Reliques* had inspired Bürger, so Bürger in turn inspired Sir Walter Scott, whose earliest production was a translation of *Lenore*. Bürger's life was spent in great poverty and misery. Thrice he married, and thrice unhappily—first in 1774, Dora Leonhart; next in 1785, her sister Auguste, the 'Molly' of his poems, who had borne him a son in Dora's lifetime; and lastly, in 1790, his 'Swabian maiden,' Elise Hahn, whom he divorced in 1792. Unfortunate speculations involved him in embarrassment; and, favourite poet

though he was of the German nation, he was left to earn his bread by translations and similar hack-work. He died 8th June 1794. See *Lives* by Döring (1826) and Wurtzbach (1900).

Burgersdorp, or BURGHERSDORP, a town (pop. 3400) of the Cape Province, 40 miles SW. of Aliwal North, was in the hands of the Boers for some months in 1899-1900. In a sheltered position near the Stormberg Spruit, it is a resort of invalids.

Burgess, or BURGHER, from the same origin as borough, means, when taken in a general sense, the inhabitant of a burgh, or much the same thing as the word citizen, but has a variety of special meanings, according to local institutions. In almost all parts of Europe the word is the proper legal description of a person who holds some peculiar privilege as a member of a municipal corporation. The burgesses of the towns of southern Europe continued for many centuries the principles and traditions of ancient Roman institutions, existing in contest and rivalry with the institutions of feudality. The burgess was virtually the *civis* or citizen of the Roman municipality, with a different name. The European monarchs frequently found it their interest to support the burgesses, as a check on the influence of the feudal aristocracy; and thus was nourished the great system of city communities, which have exercised so important an influence on the fate of the world. See MUNICIPALITY.

In the law of England the term was, prior to 1835, in general use to denote the class of persons in a corporate borough known as freemen, who were members of the corporate body, and enjoyed special rights in the corporate property. This privilege was, and to some extent still is, acquired by birth or apprenticeship—that is, by being born of a freeman, or by apprenticeship for seven years within the borough to a freeman. It might also be obtained by gift or purchase. The Municipal Corporation Act of 1835 had the effect of rendering the freemen no longer part of the body corporate, but it expressly reserved the rights of freemen to benefit from the borough property; and it also provided for the making up and preservation of a list of burgesses entitled to these reserved rights, to be called the *Freeman's Roll* (q.v.).

In the Scots law the meaning of the term is very similar to the English usage above mentioned. But there was this distinction, that a person could always be admitted to the privilege by election of the magistrates of the burgh—the burgesses taking, on the occasion of their admission, a quaint form of oath, in which they profess the religion of the country, and loyalty to the sovereign and to the provost and bailies of the burgh and their officers, and declare, *inter alia*, that they will 'make concord where discord is, to the utmost of their power.' On taking this oath, and paying the customary dues of admission, the burgess obtained an extract of the act of his admission from the town-clerk. One of the peculiar privileges of a burgess in Scotland, viz. that of his heir having a right of succession to *heirship movables*, was abolished by the Titles to Land (Scotland) Act, 1868.

The qualifications for voting in elections in municipal boroughs are now set out in the same act as that which deals with the parliamentary franchise, viz. the Representation of the People Act, 1918. That act abolished previously existing local government franchises, and established a uniform qualification for all local government purposes. A man is entitled to be registered if he is of full age, is not subject to any disqualification, is in occupation, as tenant or owner, of land or premises in the electoral area on the last day of the qualifying period, viz. 15th January or 15th July, and has been in occupation during the qualifying period,

i.e. the previous six months, of the same or any other land or premises in the area. A woman is entitled to be registered (1) where she would be entitled to be registered if she were a man, even if she is under thirty; (2) where she is the wife of a man who is entitled to be registered in respect of premises in which they both reside, has attained the age of thirty years, and is not subject to any legal incapacity. It is provided in the act that the receipt of poor relief is not to disqualify.

It is the custom for the magistrates of the more important cities and towns of the United Kingdom to admit persons of distinction, whether residents or strangers, to the position of honorary burgesses, by 'presenting the freedom of the city.' If strangers, such honorary burgesses cannot exercise the municipal franchise or be inducted to the town-council. In England, by statute, such a grant of honorary freedom must be authorised by at least two-thirds of the council present, voting at a specially called meeting.

Burgess, JOHN BAGNOLD (1830-97), a painter especially of Spanish subjects, born at Chelsea, became A.R.A. in 1877, and R.A. in 1889.

Burgess Hill, an urban district of Sussex, 8½ miles N. of Brighton; pop. 6000.

Burgh. See BOROUGH; also BURGESS.

Burgh, HUBERT DE, from 1215 to 1232 was the patriotic Justiciar of England, for the last four years the virtual ruler of the realm, but now is chiefly remembered as the jailer of Prince Arthur (q.v.). He was created Earl of Kent in 1227, and died at Banstead, Surrey, 12th May 1243. Walter de Burgh, Earl of Ulster, who died at Galway in 1291, was his grand-nephew.

Burghhead, a small fishing-town of Morayshire, on a promontory on the Moray Firth, 11 miles NW. of Elgin, has a so-called Roman well, and remains of a fort, perhaps made or modified by the Norse invader Sigurd. Remarkable carvings have been found. The burning of the 'clavie' (a tar-barrel mounted on a pole) is an ancient custom proper to old New Year's Eve. Pop. (police burgh) 1400.

Burgers. See UNITED PRESBYTERIAN; also BURGESS.

Burghley, WILLIAM CECIL, LORD, one of England's greatest statesmen, was born at Bourn, Lincolnshire, his grandfather's seat, 13th September 1520. His father, Richard Cecil of Burghley, Northamptonshire, rose high in favour with Henry VIII., and left large estates at his death in 1532. Educated at the grammar-schools of Stamford and Grantham, young Cecil thence passed in 1535 to St John's College, Cambridge, where he was remarkable alike for his diligence and aptitude in learning, but where he formed an imprudent attachment for a wine-seller's daughter, Mary Cheke, the sister of the great Greek scholar. They were married in 1541, two months after his entering Gray's Inn, but she died three years later, leaving him one son. At Gray's Inn he devoted himself assiduously to the study of law. History, genealogy, and theology also formed part of his studies at this time; and his knowledge of the last recommended him to the notice of Henry VIII., who in 1547 presented him with the valuable office of *custos brevium*. His second marriage (1545), to the daughter of Sir Anthony Cooke, procured him the patronage of the Protector Somerset, who in 1547 made him Master of Requests, and in the following year his secretary. He shared in Somerset's disgrace, even to two months' imprisonment in the Tower; but in 1550 his pre-eminent abilities secured for him the post of secretary of state, and in 1551 the honour of knighthood. During his second secretaryship,

Cecil effected most important and beneficial changes in the commercial policy of the country. With a sagacity far beyond the spirit of his age, he endeavoured to throw trade open, and did succeed in abolishing some monopolies; but others proved too strong for him, standing as he did alone, at a time when exclusive privileges were considered the only sureties of a profitable trade. During Mary's reign he conformed to Catholicism, and was one of Pole's escort from Brussels to England, but to him was mainly owing the rejection of the bill introduced into parliament to confiscate the estates of Protestant refugees. Prior to Mary's death, he had entered into correspondence with Elizabeth, who, on her accession to the throne (1558), at once recognising Cecil's capacity for government, appointed him chief secretary of state. A life of Cecil from this time until his death would be a forty years' history of England, when England was greatest, seeing that he was alike the originator and director of that policy which made Elizabeth's reign memorable above that of any other English sovereign. For although Elizabeth, in occasional caprice, might favour other courtiers, Burghley was the statesman whose judgment she relied on in all matters of consequence. His policy at home and abroad was at once shrewd and cautious, liberal and comprehensive, while he displayed a power of decision, ready and stern, when necessity demanded. As a statesman, he was above animosities and favouritism; his enemies never suffered, and his friends profited nothing, by his power. Capacity, truth, and honour were what he sought in public men. Had he been less just, history might have been more generous to his memory, whose darkest blot is his employment of a whole army of spies. The queen created him Baron Burghley in 1571, and conferred on him the Order of the Garter in the succeeding year, when he was also made lord high treasurer, an office he held till his death. His emoluments were as nothing to his expenditure, which was especially lavish in the building and beautifying of his stately mansions—Burghley, Theobalds in Herts, and Cecil House in the Strand. He died at the last of these on 4th August 1598, and was buried in Westminster Abbey. From his first-born, Thomas (1542-1622), created Earl of Exeter in 1605, was descended Henry, tenth earl (1754-1804), who in 1801 was made Marquis of Exeter, and whose marriage, as 'John Jones' in 1790, three years before his accession to the earldom, to a Shropshire maiden, Sarah Hoggins (1773-97), forms the theme of Tennyson's 'Lord of Burleigh.' From the second son, Robert (1563-1612), created Earl of Salisbury in 1605, came James, seventh earl, who was raised to the Marquisate of Salisbury in 1789.

See the *Memoirs of Lord Burghley* by Nares (3 vols. 1828-31), the *Lives* by Martin Hume (1898) and Jessopp (1904), and works cited at ELIZABETH.

Burgkmair, HANS, a noted old German painter and wood-engraver, was born at Augsburg in 1473, and died there in 1531. He was the father-in-law of the elder Holbein and the friend of Albert Dürer, whose influence is manifest in his works. Several excellent paintings by Burgkmair are preserved in the galleries of Munich, Berlin, Augsburg, and Vienna; but he is best known as a wood-engraver, his cuts amounting in all to nearly 700. Among the most celebrated of these is his 'Triumph of the Emperor Maximilian,' in 135 cuts, with a description by the emperor (see MAXIMILIAN); and *Weisskunig*, another fine series of 237 cuts.

Burglary (an Old Fr. law term, made up of *bourg*, 'a town,' and *lres*, 'a robber,' from Lat. *latro*), in the criminal law of England, is defined to

be a breaking and entering a dwelling-house by night, with intent to commit some felony therein, whether such intent be executed or not. By the Consolidation Act, 1861, night is defined as extending from 9 P.M. to 6 A.M. House means a permanent building in which the owner, or the tenant, or any member of the family habitually sleeps at night. A building may be constructed in several parts without internal communication so as to constitute separate houses, but outhouses, at least, where there is communication either immediate or by means of a covered or inclosed passage, are regarded as part of the dwelling-house. Occasional residence is sufficient, but not the mere sleeping of a caretaker in a house not otherwise used as a residence. There is 'breaking' when the intruder displaces any fastening of the house, or obtains admission by a trick, or threats of violence, or by means of a false key.

The punishment was formerly capital, but since 1837 the maximum punishment is penal servitude for life, and not less than five years' penal servitude, or two years' imprisonment. This punishment may also be inflicted in the case of breaking into a place of worship and committing a felony there, although by day. As regards similar offences during the day, and in buildings not dwelling-houses, see **HOUSEBREAKING**. Neither the name Burglary, nor the legal distinction, is known to the Scottish law, although housebreaking by night is generally reckoned a more serious affair than housebreaking by day.

In the United States, burglary is punished by state laws, but the common law is generally followed. Some states include breaking into shops, offices, warehouses, factories, and meeting-houses as burglary. An act by congress of 1825 expressly includes breaking into boats and vessels with intent to commit a felony. In some states the same deed done in the daytime is defined as burglary in the second degree. The night is the time between one hour after sunset and one hour before sunrise, or when the features of a man cannot be clearly discerned. In several states statutes have been passed defining night-time.

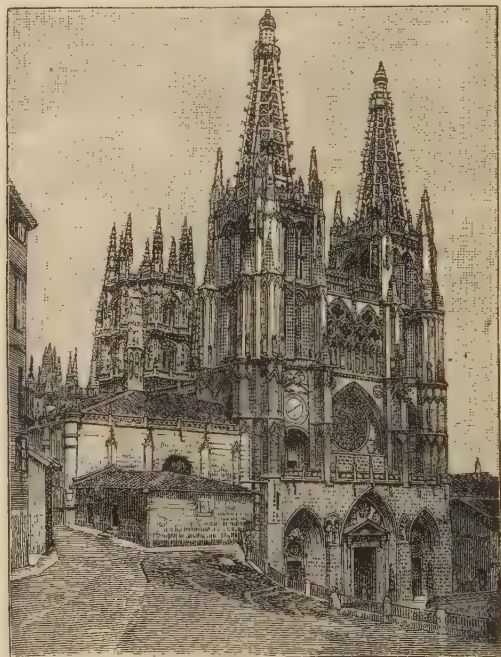
Bürglen, a village of Switzerland, in the canton of Uri, about a mile from Altorf, is the traditional birthplace of William Tell.

Burgomaster, Anglicised from the Dutch *burgemeester* (German *bürgermeister*), the title of the chief-magistrate of a town, answering to the French *maire*, English *mayor*, Scottish *provost*.

Burton, JOHN WILLIAM (1819-88), born at Smyrna, entered Worcester College, Oxford, in 1841, gained the Newdigate and an Oriel fellowship, and was vicar of St Mary's, Oxford (1863-76), professor of Divinity at Gresham College (1868-75), and Dean of Chichester from 1876. Of his forty-five works may be named *Lives of Twelve Good Men* (1888). See his *Life* by Goulburn (1891).

Burgos, the ancient capital of Old Castile, stands on the Arlanzon, 225 miles N. of Madrid, and was founded in 884. Many of the gloomy old houses of its early history still remain. In the castle, Edward I. of England was espoused to Eleanor of Castile. The cathedral, founded in 1221, ranks with those of Toledo and Leon, the three great Spanish churches of the Early Pointed period. 'Better known than either of the others,' says Mr Street, 'Burgos is inferior in scale and interest, and its character has been much altered by added works more or less Rococo in character, so that it is only by analysis and investigation that the 13th-century church is still seen under and behind the more modern excrescences.' Still, it is a glorious building, with its twin-spired western façade, its exquisite lantern, and its fifteen chapels

so rich in fine sculpture and tombs, of which there are upwards of 60, with 44 altars and fully 100 full-length statues. The church of Agueda is associated with the legend of the Cid; that of San Esteban was formerly a convent. The chief street is the Espolon, which forms a promenade by the river. The town-hall is a modern building. There are several convents in the neighbourhood. The suburbs are connected with the older part of the town by three stone bridges. Burgos was the birthplace of the Cid (q.v.), whose bones, preserved at the town-hall, were removed to the cathedral in 1921. It has manufactures of woollens



Burgos Cathedral.

and linens, and some traffic as a mart of agricultural produce. It has several hospitals and educational institutions. The university founded in 1550 is now extinct, but Burgos has an *institute* and seminaries for priests and teachers. On the removal of the court to Madrid in the 16th century, it began to decline in population and importance. It was further greatly injured in November 1808 by the French, who sacked it. In 1812 the city was four times unsuccessfully besieged by Wellington, who, however, took it in the following year, when the French blew it up, as well as the fortifications. Population, 33,000.—The province of Burgos has an area of 5651 sq. m., and a population of 340,000. The surface is elevated, the soil fertile, yielding grain and fruits. In the east are extensive pine and beech forests. The hills afford rich pasturage; coal, lignite, manganese, silver, iron, lead, and copper are found; salt and china clay are worked.

Burgoyne, JOHN, British general and dramatist, was born in 1723, and entered the army in 1740. He eloped three years later with a daughter of the Earl of Derby, resided nine years in France (1747-56), and then resuming active service, distinguished himself in Portugal by the capture of Alcantara (1762). Several years followed of fashionable life, during which he sat in parliament as a Tory, till in 1774 he was sent out to America, and in the summer of 1777 led an expedition

from Canada into the rebellious districts. On 6th July he took Ticonderoga; but on 17th October, after two engagements, his retreat cut off, and his ammunition exhausted, he found himself forced to surrender to General Gates at Saratoga (q.v.). The British and American armies at the time of the capitulation are estimated by American writers at 5804 and 10,817; by English, at 3500 and 20,000. On his return to England he lost all his appointments, and went over to the Whigs, who, when in 1782 they came into power, made him commander-in-chief in Ireland. This office he held eighteen months, and subsequently devoted himself to light literature. He was the author of some pamphlets in defence of his conduct, of *The Maid of the Oaks* (1775), and of *The Heiress* (1786), a most successful comedy. In 1787 he was one of the managers for conducting the impeachment of Warren Hastings; and he died on 3d June 1792. See his *Life* by E. B. de Fonblanque (1876).

Burgoyne, SIR JOHN FOX, Bart., engineer officer, a natural son of the above, was born in 1782. After three years at Eton (where he was Hallam's fag) and two at Woolwich, he entered the Royal Engineers in 1798; from 1800 to 1807 served in the Mediterranean; was with Moore at Corunna in 1809; and served under Wellington through all the Peninsular war, well earning the K.C.B., which he did not, however, receive till 1838. In 1814 he was commanding engineer of the expedition to New Orleans, and in 1826 of Clinton's to Portugal. In the Crimean war he was chief of the engineering department of the British army; but the discovery that Sebastopol could not be taken off-hand led, in February 1855, to his unjust recall. However, he was made a baronet in 1856, constable of the Tower in 1865, and a field-marshal in 1868, besides receiving many more marks of honour. He died 7th October 1871. See his *Life* by Colonel Wrottesley (2 vols. 1873).

Burgundy, once an independent kingdom of wide extent, and later a French province (Fr. *Bourgogne*). The ancient Burgundians (*Burgundi* or *Burgundiones*) were originally a German tribe settled on the banks of the Oder and the Vistula, who afterwards extended themselves to the Rhine and the Neckar, and in 406 penetrated into Roman Gaul. In 437 they sustained a defeat from the Huns, and placed themselves under the supremacy of the Romans, by whom they were settled in the modern Savoy. From their seat there they extended their dominion in the confusion attendant on the downfall of the Roman empire till it embraced nearly the whole Rhone valley, with the exception of Provence. Their conversion to Christianity took place in the course of eight days! They adopted a brief Arian confession of faith, and were baptised. The Burgundian kingdom was, however, unable to maintain itself against the Franks, and in 534 it was conquered by that people.

The weak government of the later Carlovingian kings allowed Burgundy once more to assert an independent existence under Boso of Vienne in 832. Boso's realm, known as Cisjuran Burgundy, or, from its capital, the kingdom of Arelate (Arles), lay mainly in the basin of the Rhone. A second Burgundian state arose about the same time in the country between the Saône and the Reuss, and was known as Transjuran or Upper Burgundy. These states, united in 930, were for a time powerful and famous; but in 1038, on the extinction of the royal dynasty, Burgundy became part of the German empire, and continued to form a part of it for nearly three centuries. It was afterwards broken into several fragments, nearly all of which were gradually absorbed by France.

In mediæval times the name of Burgundy is better known as associated with the dukedom founded by Richard, Count of Autun, a brother of the Boso above mentioned. The nucleus of the dukedom was in Lower Burgundy, the region which afterwards became the French province of Burgundy, to the north and west of the other Burgundian realms. Its brilliant period began when John of France in 1363 conferred the dukedom on his son Philip the Bold. By his marriage with Margaret, heiress of the Count of Flanders, Philip added to his dukedom a great part of the Low Countries, and was appointed regent of France during the insanity of Charles VI. of France. The quarrels of the rival dukes of Burgundy and Orleans at this period, and during the English invasions of Henry V., made a great noise in France, and were most fatal to its prosperity. In 1435 their feuds were arranged by the treaty of Arras, which led to great increase in the possessions of Burgundy. Charles the Bold (1467-77) was one of the most powerful princes in Christendom, and had a gorgeous court. The possession of the flourishing cities of Flanders made him the wealthiest monarch of Europe, and by this time the House of Burgundy had acquired almost the entire Netherlands. His power was shattered by the victories of the Swiss at Granson and Murten, and he was slain at Nancy (1477). After that Burgundy no longer played a great rôle as an independent state. Louis XI. of France, as overlord, appropriated the dukedom. Mary, daughter and heiress of Charles, marrying Maximilian of Austria, transferred to that house the rest of her dominions; and they passed to Maximilian's grandson, the emperor Charles V. The final result was, that the domains of Burgundy properly so called were incorporated with France, while its possessions in the Low Countries remained with the House of Hapsburg. The portion of Burgundy that fell to the Hapsburgs, together with the seventeen provinces of the Netherlands, formed, from 1512 till the rebellion of the Netherlands, one of the ten 'circles' of the German empire. Ultimately they went to constitute modern Belgium. See CHARLES THE BOLD, HOLLAND, PHILIP THE BOLD, PHILIP THE GOOD.—A later Duke of Burgundy (1682-1712), grandson of Louis XIV. of France, is known as the unworthy pupil of the great Fénélon.

The county of Burgundy corresponded to Franche-Comté (q.v.). The French province of Burgundy, as constituted in 1477, comprised what are now the departments of Ain, Côte-d'Or, Saône-et-Loire, and Yonne, with parts of adjoining departments; and among its towns were Dijon, Macon, Autun, Chalon-sur-Saône, and Bourg.

See also FRANCHE COMTÉ; Dubois, *La Bourgogne* (1867); Percy Allen, *Burgundy* (1912); Bryce's *Holy Roman Empire* (appendix); and the historical maps at EUROPE.

Burgundy Pitch, a resinous substance prepared from common Frankincense (q.v.), the spontaneous exudation of the Norway spruce-fir (*Abies excelsa*; see FIR) by melting it in hot water, thus freeing it from a great part of its volatile oil, and straining. Burgundy pitch is of a yellowish-white colour, hard and brittle when cold, but softening by the heat of the hand, and readily adhering to the skin. It has a not unpleasant resinous odour, and when pure, no bitter taste. It is used in medicine as an external application only, and generally acts as a mild irritant. Although it used to be in great demand in medicine, it is not much used now. It enters also as an ingredient with resin, oils, &c. into a compound plaster of similar use. The Burgundy pitch of commerce is now principally brought from Finland, Austria, and Switzerland; but the greater

part of what is sold under that name is made by melting together pitch, rosin, and turpentine, and agitating with water, thereby imparting to it the necessary yellowish colour. This imitation may be distinguished from the genuine Burgundy pitch by its bitter taste, less agreeable odour, and by its not being soluble in twice its weight of glacial acetic acid.

Burgundy Wines are chiefly the produce of vineyards cultivated on the hilly lands forming the Côte-d'Or, and rank amongst the finest in the world. The wines of Upper Burgundy, and the wines of Lower Burgundy (Yonne), Macon, and Beaujolais, are other two groups of Burgundies. The finest of the *white* Burgundy is Mont Rachet; Chablis is a *white* wine of Lower Burgundy. Beaune is the centre of the trade. The most celebrated of the *red* wines of Burgundy are Romanée-Conti, Chambertin, Richebourg, Clos-Vougeot.

Burhanpur, a town of India, in Nimar district, Central Provinces, on the north bank of the Tapti, 280 miles NE. of Bombay, and 2 from the railway station of Lálbágh. The remains of buildings show that the town extended over an area of 5 sq. m. when under the Moguls. Eight sets of aqueducts can still be traced. The city was taken by General Wellesley in 1803, but it was only in 1860 that Burhanpur came completely under control of the British government. The town contains a palace built by Akbar, and a mosque built by Auringzebe. Although on the decline, there are still some manufactures of gold wire, cotton and muslin, silk, and brocade, for which the place was formerly notable. Pop. 23,000.

Burial, a word of Teutonic origin (O.E. *byrgan*, 'to bury'), is applied to the prevalent method among civilised nations of disposing of the dead by committing them to the earth. The general tendency of mankind has always been to bury the dead out of sight of the living; and various as the methods of accomplishing this end have been, they have resolved themselves into three great classifications: (1) The simple closing up of the body in earth or stone; (2) the burning of the body, and the entombing of the cinders; and (3) the embalming of the body. The first of these is the earliest form of which we have any knowledge. The palæolithic cave-dwellers of France and Belgium buried their dead in natural grottos and crevices of the rocks similar to those in which they lived. The later stone-age people throughout Europe buried in chambered barrows and cairns. The bronze-age people buried in unchambered barrows, or in cemeteries of stone cists set in the ground, often in natural eminences of sand or gravel, or surrounded by circles of standing stones. Cremation was practised side by side with simple inhumation throughout the prehistoric period. It was also a general characteristic of burial in pagan times that the dead, whether cremated or not, were provided with grave-goods, such as urns or vessels of clay, bronze, gold, or glass, clothing and personal ornaments, implements, and weapons. Christianity abolished cremation, and restricted the provision of grave-goods to the burial of kings and priests, who continued to be interred in their royal and sacerdotal robes, and with their insignia of office. The stone cist became the stone-lined grave of the early Christian cemeteries, and the stone sarcophagus, which can be traced back to the time of the Egyptian kings who built the Pyramids, continued throughout the middle ages. In the first four centuries of the Christian era the Christians at Rome had buried their dead in the Catacombs, a series of subterranean excavations, consisting of long horizontal passages, with recesses on either side, arranged in tiers, for the reception of the

bodies, closed in by slabs bearing inscribed memorials and emblems of the faith. During the persecutions of the 2d century the Catacombs were used as places of assembly for worship; and the association of the church and the cemetery thus established has continued ever since. It was not till the 9th century, however, that the formal consecration of churchyards became customary. In Egypt, and perhaps also in Palestine, the Christian church inherited the practice of embalming, to which there is frequent allusion in the Scriptures. The Israelites may have learned the art from the Egyptians, among whom it was so extensively practised, that Egyptian corpses, as inoffensive as any article of wood or stone, are scattered over Europe in museums, and are even to be found as curiosities in private houses. The soil and climate of Upper Egypt seem to have afforded facilities for embalming unmatched in any other part of the world; and in other places the vestiges of the practice are comparatively rare, though it is not unusual even yet to embalm royal corpses, and in some places to preserve a series of desiccated bodies, as in the vault of the monastery of Kreuzberg, at Bonn, where the monks have been successively preserved in their costume for centuries. Cremation is described in the Homeric poems as an honourable mode of sepulture practised in the heroic ages of Greece. The Romans, who in the time of the Republic had interred their dead, adopted the Grecian usage in the days of Sulla. It is mentioned in the Sagas as the older custom of the early Norsemen, who used occasionally to place the viking in his ship, and 'send him flaming out to sea,' instead of entombing him beneath the mound of earth, with all his belongings, in his vessel set on even keel, which was the more usual method. The Esthonians also practised cremation; and the custom was retained till the 10th century among the tribes along the Volga, along with the horrible accompaniment of human sacrifice in honour of the dead, as we learn from the narrative of Ahmed Ibn Fozlan, who states that he was an eye-witness of the whole ceremonies. It was prohibited among the conquered Saxons, under pain of death, by Charlemagne. It is still practised in India, but without the suttee, or burning of the living widow with the corpse of the husband. Until quite recently cremation was a common custom in Japan, and was practised side by side with unburned interment. The latter has been the universal custom in Europe from the several dates of the introduction of Christianity into the different countries.

Some of the grandest buildings in the world have been tombs; such are the Pyramids, the castle of St Angelo, the tomb of Cæcilia Metella, and many temples in eastern countries. The notion that the dead may require the things they have been fond of in life has also preserved to the existing world many relics of the customs of past ages; the tombs of Egypt have supplied an immense quantity of them, which have taught the present age more of the manners of ancient nations than all the learned books that have been written. Herodotus tells us of favourite horses and slaves sacrificed at the holocaust of the dead chief. The same thing has been done in our own day in Ashanti.

Amongst the ancients an unburned or unburied body was held to be disgraced, and the spirit was unhappy till a kindly stranger at least threw a few handfuls of earth on the corpse. In the Christian countries, too, the denial of the rite of Christian burial involved a judgment on the life of the deceased; this sad fate was usually or frequently reserved for the unbaptised, including unbaptised infants, non-Catholics, excommunicated persons, notorious mockers at religion and evil livers, unrepentant sinners, persons who did not take the

Eucharist at least once a year, executed criminals, suicides, persons who fell in duels; and till the Revolution every French stage-player had to be content with burial in unconsecrated ground. Thus in 1730 the brilliant actress, Adrienne Lecouvreur, had for this reason alone to be buried in unconsecrated ground without the semblance of a religious rite, in spite of strong pressure brought to bear on the Archbishop of Paris.

In England, burial in some part of the parish churchyard is a common-law right, which may be enforced by mandamus—that is, every person may be buried in the parish where he dies. But the body of a parishioner cannot be interred in a metal coffin or vault, or even in any particular part of a churchyard, as, for instance, the family vault, without an additional fee. By the canons of the Church of England, clergymen cannot refuse or delay to bury any corpse that is brought to the church or churchyard; on the other hand, a conspiracy to prevent a burial is an indictable offence. It is a popular error that a creditor can arrest or detain the body of a deceased debtor; and the doing such an act is indictable as a misdemeanour. It is also an error that permitting a funeral procession to pass over private grounds creates a public right of way. By Acts of 1823, the inhabitants of any parish, township, or place, when going to or returning from attending funerals of persons in England who have died and are to be buried there, were exempted from any toll within these limits; and in 1824 the same regulation was extended to Scotland; the only difference being, that in the latter case the limitation of the district is described by the word *parish* alone. Not till 1823 was the barbarous mode of burying suicides at cross roads, with a stake driven through the body, abolished. It was then enacted that their burial should take place, without any marks of ignominy, privately in the parish churchyard, between the hours of nine and twelve at night, under the direction of the coroner. In Scotland, the right of burial in a churchyard is an incident of property in the parish; or of residence or death within its bounds, the *solum* or ground being dedicated to the use of all persons so entitled to burial. Registration (q.v.) of death should precede burial. The solemn rites of burial at sea are regulated by the necessities of the case. Usually the dead body is sewn up in a hammock, with a weight attached to the feet, and a modified form of the English burial service is read before the body is committed to the deep.

At various times, and in various places, there has been much popular excitement as to the possibility or probability of persons being buried in a state of suspended animation, but still really alive. Few of the many stories of cases of this kind have been authenticated; if any such occurs, it must be the result of inexcusable haste and carelessness. A competent medical man can easily decide by auscultation whether the heart has ceased to beat. (For the other signs of death, see DEATH, CATAPLEPSY.) In some places the dead are kept for a time in mortuary houses specially fitted up for the purpose—a bell-pull being attached to the extremities of the corpse, so as to give a summons on the smallest motion of the body. But these precautions have always proved needless; a corpse has never revived under such circumstances.

In Christian countries, if the remains of the saint to whom a church was dedicated could be obtained, they were buried near the altar in the choir. It became a prevalent desire to be buried near these saints, and the bodies of men eminent for their piety, or high in rank, came thus to be buried in churches. It can scarcely be said that a practice so detrimental to the public health as the burial

within churches, was checked in this country until the whole system of intramural interment, including the practice of pit burial, as it was called, was attacked by Southwood Smith, Walker, Chadwick, and other sanitary reformers. Measures were afterwards carried for shutting graveyards in crowded cities, and placing interments in open cemeteries under sanitary control. The first great measure was passed in 1850, when the Board of Health was made a Burial Board for the metropolis, and power was given to the Privy-council to close the city graveyards. The act was extended to the English provinces in 1853, and to Scotland in 1855, and has been repeatedly amended.

The main features of burial legislation are these: The Privy-council may, on the representation of the Home Secretary, order the discontinuance of burial in any graveyard, and may interfere to prevent any vault or place of burial becoming dangerous to health. They may also regulate burials in cemeteries established under statute. Licenses may be got for the continued use of private vaults and graves. The Privy-council may also require the vestry in an English parish to meet and consider whether a new burial-ground shall be provided. If they proceed, a burial board of from three to nine persons is appointed by the vestry. Town-councils in boroughs, and local boards of health, may be constituted burial boards by order in council. Parishes may combine for this purpose, and the burial-ground need not be within the parish. It must not be within 100 yards of any dwelling-house, without the consent of the owner in writing. Part of the burial-ground must be consecrated, part unconsecrated; but the fees, which are subject to public control, must be the same in both parts. The boards are authorised to arrange for the conveyance of the dead, and to provide reception-houses. They are also bound to keep accurate registers of interments. Any expenses beyond receipts are charged on the poor-rate. In 1872 very valuable suggestions for providing and managing burial-grounds were issued by the Home Secretary. These deal with situation, soil and drainage, paths, fencing and planting, size of grave spaces (which should be 9 feet by 4 feet, or 4 square yards, with a depth of from 4 to 6 feet), reopening of graves, which is permitted after 14 years, &c. The controlling authority in such matters in England as in Scotland is the Parish Council. The burial boards in England have expended millions on cemeteries; thousands of churchyards have been closed. There is also a very large number of cemeteries conducted by companies for profit. The administrative arrangements in Scotland are very similar; the ratepayers are entitled to raise the question of closing an old, or providing a new burial-ground by petition before the sheriff. (For Disinterment, see EXHUMATION, POST-MORTEM EXAMINATION, RESURRECTIONISTS.)

In the United States, neglect to bury a dead body by any one whose duty it is to bury it, and having sufficient means to do so, is a misdemeanour. It is also a misdemeanour to fail to notify a coroner that a body on which an inquest ought to be held is lying unburied, or to bury or otherwise dispose of such body without giving notice to the coroner.

For other matters connected with the subject of burial, see CEMETERIES, CHURCHYARDS; CREMATION, EMBALMING; TOMB, COFFIN, CATACOMBS, BARROWS, CAIRNS, PARISH, PYRAMIDS, STONE AGE, TOPE.

Burial Societies are friendly societies, with the express object of supplying (by means of small periodical contributions) a fund for paying the funeral expenses of members. In addition, many friendly societies, benevolent societies, and industrial insurance companies include among their main

purposes insurance of funeral expenses of members and their nearest relatives. The proceedings of the criminal courts having shown that in some instances children on whose lives such an insurance was effected had been killed or allowed to die of neglect, and that children were frequently insured in more than one society, various precautions were enforced under the Friendly Societies Act. The insurance on the death of a member's wife, widow, or child over ten years of age, under cover of funeral expenses, of sums obviously exceeding the probable cost of the funeral was made illegal; and the payment of money on the death of children under ten has been made subject to special limitations and conditions—viz. no one or more societies or branches can insure or pay, (a) on the death of a child under five, more than £6 in all; (b) on the death of a child over five but under ten, more than £10 in all. Such sums are payable only to the parent or his personal representative (executor or administrator), payment to a guardian or other relative not being valid. A specially-filled-in death certificate must be produced. These restrictions apply to both registered and unregistered friendly societies, benevolent societies, and industrial assurance companies; and such insurance by other bodies is illegal. See FRIENDLY SOCIETIES, INSURANCE, REGISTRATION.

Buriats, a Mongol race, with several branches; in east Siberia, on both sides of Lake Baikal, numbering about 207,000. The Moscow Soviet government conceded autonomy to the prevailingly Buriat region west of Lake Baikal (southern Irkutsk), that to the east falling within the Far Eastern Republic. The Buriats are a peace-loving but slothful and discourteous people, prone to petty thefts, and passionately fond of drink. Though some have become good farmers, the majority are nomads, breeding cattle, or living by hunting and fishing. Some of the tribesmen have of late years, however, studied with success several branches of science; and the blankets, leather, and metal-work of the people are known throughout Siberia. Those dwelling west of the lake have conformed to the Greek Church, and the others have adopted Buddhism; but of most, Shamanism (q.v.) is still the actual religion. Under Russian rule since 1644, they yet preserve among themselves a patriarchal form of government. There is a Grammar and Vocabulary by Castren and Schiefner (St Petersburg, 1857) of their language; and a Grammar by Orloff (1878).

Buridan, JEAN, a French schoolman of the 14th century, born at Béthune, in Artois, about 1300, studied at Paris under Occam, became himself a teacher of the nominalist philosophy, and was rector of the university of Paris in 1327. Of his life almost nothing is known, but it is certain that he was alive as late as 1358. There is a tradition that he had to flee from France, and that at Vienna he helped to found the university, but this is contrary to historical fact. His works treat of logic, metaphysics, physics, ethics, and politics—almost every subject save theology, which he avoided because it does not rest on reason alone, the sole authority in philosophy. Like Occam, he denied objective reality to universals, which are mere words, singulars or individuals alone existing (see NOMINALISM). In his comments on the *Nicomachean Ethics* of Aristotle he makes the will depend entirely on motives, the only freedom being a certain power of suspending the judgment and determining the direction of the intellect. The celebrated sophism known to the schoolmen under the name of Buridan's Ass, has been discussed at superfluous length, and with needless ingenuity, by Bayle. It occurs nowhere in his

books, and was no doubt due to some opponent who wished to cast ridicule upon his determinism. The sophism referred to is, that if a hungry ass be placed exactly between two bundles of hay of equal size and attractiveness, it must starve, as there is nothing to determine the will of the animal towards either bundle. (This hypothetical case is, however, found in Aristotle, *De Caelo*, ii. 14, and in the fourth book of Dante's *Paradiso*.) His chief works are *Summula de Dialectica* (1487), *Compendium Logice* (1489), *In Aristotelis Metaphysica* (1518), and *Questiones in x. libros Ethicorum Aristotelis* (1489).

Burin, or GRAVER (Fr. *burin*, from Ital. *borino*; but originally cognate with English *bore*), the principal instrument used in copper-engraving, is made of tempered steel, and is of prismatic form, the graving end being ground off obliquely to a sharp point. The distinctive style of a master is frequently described by such expressions as a *soft burin*, a *graphic burin*, or a *brilliant burin*.

Burino. See CHIZEROTS.

Buriti Palm (*Mauritia Sagus vinifera*), a beautiful palm which grows in great abundance in the swamps of Northern Brazil, particularly on the Orinoco. It is one of the loftiest of palms, reaching 100 feet. The stem yields a kind of sago, which is cut in slices and eaten like bread; the pulp and seed of the sago-like fruit are eaten and made into sweetmeats—and the abundant sweet sap before flowering is drunk fresh, or is easily fermented into palm wine by the natives. Humboldt describes how the Guarani people at the mouth of the Orinoco not only derive their food from the tree, but make their nets, mats, hats, &c. from its fibres and leaves, and yet more literally live upon the tree, by suspending huts of its matting from stem to stem during the rainy season, annually returning to this arboreal existence. *M. flexuosa*, the Moriti or Sea Palm of Trinidad and Brazil, is of similar appearance and uses; but its leaves yield better fibre, and its stem a useful wood.

Burke, EDMUND, a celebrated orator and philosophic politician, was born in 1729 at Dublin, where his father had an extensive practice as an attorney. In 1741 Burke was sent to school at Ballitore, in the county of Kildare, and in 1743 entered Trinity College, Dublin. His undergraduate course was not marked by the ordinary distinctions, and he mainly devoted himself to a very extensive and desultory course of reading. Cicero was his favourite author. In 1748 he graduated B.A. Being destined for the English bar, he proceeded to London in 1750 to keep his terms at the Middle Temple. He never took kindly, however, to legal studies, and ultimately abandoned the idea of becoming a barrister.

The period from 1750 to 1760 in the life of Burke was a time of obscurity, spent chiefly in literary work, which in time brought him a considerable reputation. His first important publication was the celebrated *Vindication of Natural Society*, written in imitation of the style and ridicule of the reasoning of Lord Bolingbroke, in which, with well-concealed irony, he confutes Bolingbroke's views of society by a *reductio ad absurdum*. It was published anonymously in 1756, when its author was twenty-seven; with many of its readers it passed as a serious work. Soon after, in the same year, appeared his well-known essay, *A Philosophical Inquiry into the Origin of our Ideas of the Sublime and Beautiful*—a treatise which attracted considerable attention both in this country and in Germany, and which, though crude, contains much able and independent thinking (see AESTHETICS). The same year Burke made a happy marriage with the daughter of a Bath physician, Dr Nugent.

In 1759 the first volume of the *Annual Register* appeared, a work which Burke originated, and to which he contributed largely till 1788. These writings of Burke not only introduced him to society, but opened up a wider field of activity. In 1761 Mr W. G. Hamilton ('Single-speech Hamilton'), then Secretary for Ireland, having appointed him his private secretary, he returned to Dublin, where he spent about two years, and received a pension on the Irish establishment of £300. In return for this favour Hamilton claimed that Burke should thenceforward devote his whole time to his special service, with the result that they had a violent quarrel, and Burke threw up his pension.

On his return to London he became a member of the Literary Club, the history of which is associated with almost every considerable name in the literature of the period. But literary society did not draw his attention from the chances of a political career. In 1765 he became private secretary to the Marquis of Rockingham, at that time premier, and in the same year was returned to parliament as member for Wendover. He obtained the seat through the influence of Lord Verney. His eloquence at once gained him a high position in the Whig party, and in the House of Commons. The Rockingham administration, however, lived only about a year, and with it terminated his second political employment. Though he held no office till the downfall of the North ministry in 1782, the public activity of Burke never ceased till his death. His eloquence, political knowledge, and force of character gave him a foremost place among the statesmen of the time.

The times were, indeed, unfavourable for a *new man*, who had only his natural genius to rely on for advancement, and whose strong convictions unfitted him to be an instrument of mere court or party interests. At that time there were two great forces in English politics, the court and the territorial aristocracy. With the accession of George III., the court had reasserted itself, and by an unsparing use of the public money in influencing elections, had gathered round it a powerful party. George III. found a willing servant in Lord North, whose long administration from 1770 till 1782 was marked by the unsuccessful coercion of the American colonies, by corruption, extravagance, and a prevailing reaction. Against this policy Burke and his Whig friends could only raise a strong protest. The best of Burke's writings and speeches belong to this period, and may be described as a defence and exposition of sound constitutional statesmanship against prevailing abuse and misgovernment. His first great pamphlet was *Observations on the Present State of the Nation*, a reply to George Grenville, written in 1769. In 1770 he published another great political pamphlet *On the Causes of the Present Discontents*, which treats of the many questions arising out of Wilkes' controversy, and the attitude of the court. Three great writings on the American struggle are perhaps the finest of his many efforts. These are the speech on *American Taxation* (1774), the speech on *Conciliation with America* (1775), and the *Letter to the Sheriffs of Bristol* (1777). In all three Burke is the advocate, with reference to the colonies, of wise and liberal measures, which would have averted all the mischief that ensued. In 1774 Burke had to retire from his seat for Wendover, but the important constituency of Bristol elected him as its representative. His Bristol seat he lost through loyalty to his political convictions. He claimed the right not to be a mere delegate, but the reasoning and independent representative of his constituents. When proposals were made for relaxing the restrictions on the trade of Ireland with Great Britain, and for alleviating the laws against Catholics, he

supported them in opposition to the wish of his Bristol constituents. With regard to Ireland generally, he showed a knowledge of her affairs, and a sympathy with her people, worthy of the best statesmanship. He had a kindly and reverent feeling for Catholicism; his mother and wife had been brought up in that faith, and he always advocated a broad and liberal policy towards its members.

The enlightened views of Burke were not pleasing to the majority of his Bristol constituents. He lost the seat in 1780, and from that time till 1794 he represented Malton. When the disasters and difficulties arising out of the American war had at last brought Lord North's government to a close, Burke's patron, Lord Rockingham, was called to office in 1782. Under him Burke held the post of Paymaster of the Forces, and he resumed it under the coalition government headed by the Duke of Portland in 1783. His tenure of office on each occasion was for only a few months; and the emoluments were reduced to £4000 a year in accordance with the principles laid down by himself in his *Plan for Economical Reform*.

After the fall of the Whig ministry in 1783 Burke was never again in office, and he was so far misled by party feeling that he opposed Pitt's measure for Free Trade with Ireland and the Commercial Treaty with France. In 1788 he opened the trial of Warren Hastings by the celebrated speech which will always rank among the masterpieces of English eloquence. Till his death the energies of Burke were now practically absorbed by the French Revolution. Loving 'liberty only in the guise of order,' he had from the beginning regarded the proceedings of the Revolution with suspicion. In 1773, during a visit to Paris, he had learned to dread the new opinions current amongst the leaders of French thought, and the excesses which soon marked the progress of the revolutionary movement made him tremble for social order. In 1790 he appeared as the champion of the old state of things in Europe by the publication of his famous *Reflections on the French Revolution*. This book had an influence far beyond that of any other writing of Burke. In less than a year it reached its eleventh edition. It was read all over Europe, and tended powerfully to encourage its rulers in a strenuous resistance to the Revolution. In the subsequent career of Burke, his attitude to the Revolution had a decisive influence, alienating him from Fox and many of his other Whig associates, but giving him a position of credit and honour in the political world, and especially with the reactionary portion of it, which he never enjoyed before. As time went on, Burke became more and more vehement in his denunciations of the French innovations, till he became incapable of expressing a calm and rational judgment about them. Most of his subsequent writings, the *Appeal from the New to the Old Whigs*, *Thoughts on French Affairs*, and *Letters on a Regicide Peace*, are marred by the passion with which he urges the government not only to fight the Revolution but to suppress free opinions at home. Burke died 9th July 1797. He was buried in the little church at Beaconsfield, where in 1768 he had purchased the estate of Gregories. During his whole political life Burke's private affairs were sadly embarrassed. He had to borrow money to buy his estate, and he was always deeply in debt. He had considerable pensions granted him in 1794. A proposal to raise him to the peerage under the title of Lord Beaconsfield on his retirement from the House of Commons in that year, was arrested by the death of his only son.

Burke ranks as one of the foremost orators and political thinkers of England. He had vast knowledge of affairs, a glowing imagination which kindled everything he touched, a wide and passion-

ate sympathy with the most remote and unfamiliar conditions of life as shown in his great speeches on India, and an inexhaustible wealth of powerful and cultured expression. His manner and delivery as a speaker, however, was unattractive and even awkward and ungainly. Speeches which captivated the reader only served to empty the benches of the House of Commons. Generally, and especially in his earlier days, he was on the side of an orderly freedom and a well-considered progress; yet it should be remembered that party feeling led him to oppose some of the wisest and most liberal measures of the younger Pitt, and that the fiery vehemence of his utterances on the French Revolution did much to let loose the passions which made Europe a scene of war for three and twenty years. His views were lucid, comprehensive, and philosophic. Society he regarded as a stable and orderly system moved by large historic influences; but in his passionate reverence for ancient order, he greatly exaggerated the value of things as they were. The irritable and untractable temperament which grew upon him during his later years, together with his circumstances as a *new man* handicapped by social prejudice, prevented him from attaining a worthy position in the ministries of the time. Yet in the application to politics of vast knowledge, high moral principle, great intellectual power, and rich and noble gifts of expression, he still stands unrivalled among English statesmen and orators. Sir Walter Raleigh holds that Burke's range of thought and language is wider than that of any other English prose-writer: the 'Letter to a Noble Lord' being perhaps the greatest example of his rhetoric and eloquence.

Editions of his collected works were published in 1792-1827 and 1852 (8 vols.), of his letters (3 vols.) in 1844, and of his Irish writings by Matthew Arnold (in 1881). There are Lives by Prior (1827), Crole (1840), Macknight (1858), as well as by Lord Morley (1867) and, in the 'Men of Letters', 1879. And see Dilke's *Papers of a Critic, Lecky's England in the 18th Century*, Lord Holland's *Further Memoirs of the Whig Party* (1905), and John MacCunn's *Political Philosophy of Burke* (1913).

Burke, Sir John Bernard, herald and genealogist, the son of John Burke (1787-1848), representative of a Tipperary family, who settled in London as a literary man, and in 1826 published the *Peerage and Baronetage of the United Kingdom*. The son, born in London in 1815, and educated at Caen in Normandy, was trained as a lawyer, and called to the bar in 1839. In 1853 he was appointed Ulster King-of-arms, was knighted in 1854, became LL.D. of Dublin in 1867, C.B. in 1868, and in 1855 keeper of state papers in Ireland. He died 13th December 1892. Besides editing the successive issues of the *Peerage* founded by his father, he published other works on *Landed Gentry* (1846), *Extinct Peerages* (1846), *Anecdotes of the Aristocracy* (1849), *Family Romance* (1853), *The Vicissitudes of Great Families* (1859), *The Rise of Great Families* (1873), and *Reminiscences* (1882).

Burke, Robert O'Hara, one of the first white men to cross the Australian continent from south to north, was born at St Cleram, County Galway, in 1820, was educated in Belgium, served in the Austrian army (1840), became captain, joined the Irish constabulary (1848), and emigrated to Australia in 1853. While inspector of police in Victoria he accepted the leadership of an expedition for crossing the Australian continent. After many hardships, Burke and Wills reached the tidal waters of the Flinders River. Burke died of starvation on his return journey, 28th June 1861. An expedition brought his remains and Wills's to Melbourne; and statues have been erected to their memory; but their incompetence is recognised.

Burke, William, born in 1792, the partner with William Hare in a series of infamous murders. Both Irishmen and labourers, the latter started a lodging-house in a West Port close, Edinburgh, to which Burke came to live in 1827. Towards the close of that year they sold for dissection to Dr Robert Knox, instead of burying it, the body of an old pensioner who had died in the house, and the ease and safety with which they had earned this money tempted them to commit a series of murders to procure more bodies. Their plan was to inveigle unknown travellers into the lodging-house, make them drunk, and then suffocate them in such a way that the bodies showed no marks of violence. With the help of their wives they had already murdered fifteen persons, and received from Dr Knox for their bodies sums of money varying from £8 to £14, when their infamous trade was discovered by the police, aroused by the suspicions of the neighbours. Hare, the more execrable wretch of the two, was admitted king's evidence, and after his release found shelter in a nameless obscurity; while Burke was hanged, amid the execrations of the crowd, 28th January 1829. His abhorred name has added a word to the English tongue.

Burkitt, William, commentator, was born at Hitcham, Suffolk, in 1650. He was educated at Stowmarket, and Pembroke Hall, Cambridge, and must have been ordained at a very early age, as in 1672 he was curate, afterwards rector, at Milden, in Suffolk. In 1692 he was preferred to the vicarage of Dedham, in Essex, and here he died in 1703. Burkitt's sermons were soon forgotten; his *Notes* on the four Evangelists, and his *Expository Notes* on the New Testament, were long popular. The last was a meritorious compilation, although as Doddridge said, the 'sentiments vary in different parts of the work, as the authors from whom he took his materials were orthodox or not.'

Burleigh. See BURGHEY, and BALFOUR (JOHN).

Burlesque (through Fr. from Ital. *burla*, 'a jest'), denoting a style of speaking, acting, writing, drawing, is a low and rude grade of the comic. The legitimate comic brings together contrasts with a final view to harmonising and reconciling them; the burlesque distorts and caricatures, and brings the incongruities into stronger relief. The farce is the burlesque of comedy. Deformities and monstrosities that excite disgust do not belong to the burlesque. The lofty and the abject, the great and the little are conjoined, with the sole view of exciting a laugh. Nor does the true burlesque turn real greatness and nobility into laughter, but only sham greatness—false pathos, and all hollow pretension and affectation. There is pure burlesque in Aristophanes, but the modern burlesque in sustained form may be said to have originated among the Italians, more particularly with the poet Berni. The genuinely national *buffone* of the Italians personates the burlesque. Carlo Gozzi, in his tragi-comedies, is perhaps the greatest in this vein. Some of the more remarkable burlesques in English literature are Chaucer's *Rime of Sir Thopas*, a burlesque of the long-winded and interminable stories of the middle ages; Beaumont and Fletcher's *Knight of the Burning Pestle*, on the imitations of the tales of chivalry; and the Duke of Buckingham's play, *The Rehearsal*, intended to ridicule the heroic language in contemporary plays. There are no happier examples in English than some of *The Rejected Addresses*. Butler's *Hudibras* has much of the burlesque in it, but is a book that stands quite by itself. Similarly, *Don Quixote* contains burlesque elements enough, while it is one of the greatest and wisest books in the world. Parody (q.v.) or Travesty is a species of

burlesque. See *Burlesque Plays and Poems* in Morley's 'Universal Library' (1887), and W. D. Adams's *Book of Burlesques* (1891).

Burlingame, ANSON, American diplomatist, born in 1820 at New Berlin, New York, was educated at Harvard, and after settling as a lawyer at Boston, became a prominent member of the Free-soil party. Elected to the Massachusetts senate in 1853, he entered congress in 1854. He was sent as United States minister to China by President Lincoln; and when, in 1867, he was returning home, the regent, Prince Kung, made him special Chinese envoy to the United States and the great powers of Europe. As such he succeeded (1868) in securing the acceptance and ratification by the United States and China of the Burlingame treaty, by which China officially accepted the principles of international law. He subsequently visited England, France, Denmark, Sweden, Holland, Prussia, and Russia as Chinese envoy, and died at St Petersburg, 23d February 1870.

Burlington, the name of three cities in the United States: (1) The capital of Des Moines county, Iowa, on the right bank of the Mississippi (here crossed by a railway bridge), 207 miles WSW. of Chicago by rail. It occupies a natural amphitheatre formed by the limestone bluffs which slope backward from the river, and is an important centre. Laid out in 1834, it is the seat of a Baptist college, and has manufactures of machinery, farming implements, flour, carriages, &c. Pop. (1870) 14,930; (1920) 24,057.—(2) A port of entry of Burlington county, New Jersey, on the Delaware, 20 miles above Philadelphia, with which, as well as with New York, it is connected by rail. It possesses an Episcopalian college (1846), and large manufactures of shoes, ironware, thread, &c. Pop. 9000.—(3) A port of entry and capital of Chittenden county, Vermont, and the most populous city in the state, beautifully situated on the eastern shore of Lake Champlain, 40 miles WNW. of Montpelier by rail. It has a good harbour, with a breakwater and lighthouse, and has access by canals and the Richelieu River to the Hudson and St Lawrence, besides railway communication with all parts of the United States and Canada. It is the seat of the State Agricultural College (1865), and of the Vermont University (1800), which crowns the slope on which the city stands. It has cotton, flour, and planing mills, machine-shops, and manufactures of furniture, &c., and is one of the largest lumber markets in the United States. Pop. (1870) 14,387; (1880) 11,365; (1890) 14,590; (1920) 22,779.

Burlington. See BRIDLINGTON.

Burma, called *Myamma* or *Bamā* by the Burmese, the largest province in the British Indian Empire, has a total area of 238,738 sq. m., of which the central portion forming Burma proper occupies 168,573 sq. m., the Chin Hills to the west 10,250 sq. m., and the Shan States to the east 59,915 sq. m. It marches with Siam, French Indo-China, and China on the east; Tibet and Assam on the north; Assam, Manipur, and Chittagong on the north-west; and the Bay of Bengal and the Indian Ocean on the west and south-west, its seaboard having a length of about 1200 miles. Its extreme length is about 1200 miles, from 10° to 28° north lat., and its greatest breadth 575 miles at about 21° lat. (from the Mekong River to the Bay of Bengal); but the southern portion (Tenasserim), from about 17½° southwards, is a narrow seaboard strip. The north-western seaboard, Arakan, stretching from Cape Negrais to the borders of Bengal, forms also a narrow maritime tract, separated from Burma proper by the Arakan Yoma Hills. The main central portion, Burma proper, consists mainly of

the drainage-area of the Irrawaddy, the Sittang, and the Salween. Lower Burma (annexed 1852) was separated from Upper Burma (taken in 1886) merely by a line of pillars.

In Burma the hill-ranges lie mainly north and south, and the large rivers run mostly in the same direction. The chief hill-ranges are the Arakan Yoma, rising to 10,000 feet (Likilang), forming the western watershed of the Irrawaddy; the Chin and Naga Hills and the Kumon range, to the west of the Upper Irrawaddy; the Kachin, Shan, and Karen Hills, extending eastwards from the Irrawaddy valley into China, then trending southward as a narrow range forming the eastern watershed of the Salween, and separating Tenasserim from Siam. The highest hills are in the eastern Kachin range, where two peaks (Sabu and Worang) on the watershed between the Irrawaddy and the Salween rise to about 11,200 feet above sea-level; while in the Ruby Mines district, a little to the south of that, several peaks rise above 7000 feet. The Pegu Yoma, forming the watershed between the Irrawaddy and the Sittang, nowhere attains any considerable height; though the Paunglaung range, between the Sittang and the Salween, has several peaks over 5000 feet high. But one of the most interesting hills is Popa, in the Myingyan district, near the geographical centre of Burma, an extinct volcano rising from the plains to a height of about 5000 feet. A conspicuous landmark, it is an object of superstitious veneration in local folklore. The Shan States, to the east of Central Burma, consist of a plateau, with an elevation of 2000 to 4000 feet, but cleft by deep limestone gorges and chasms walling in the Salween and its tributaries.

The chief river is the Irrawaddy, formed by the junction, at about 25½° north lat., of the Mali and N'mai rivers, whose unknown sources are probably in the snow-covered mountains of Tibet. Its chief tributary, the Chindwin, rising in the Chin and Naga Hills, is much larger than any of the other rivers having their drainage-area entirely in Burma, such as the Koladan in Arakan, the Sittang in Lower Burma, and the Tenasserim in Tenasserim. Though the Salween is longer than the Irrawaddy, it is of far less importance, as it mostly flows through rocky gorges, and is navigable for steam-launches only for about 80 miles from Moulmein, on the Gulf of Martaban. The Irrawaddy is navigable throughout the year up to Mandalay (650 miles) by large steamers, with two flats or cargo-barges attached, and by smaller steamers up to Bhamo, 900 miles from Rangoon and within 50 miles of the Chinese frontier; while during the rainy season steamers can ascend to the confluence of the Mali and N'mai, about 150 miles north of Bhamo. Of its main tributaries, the Chindwin is navigable for steamers for 300 miles above its junction; the Mogaung, Shweli, and Myit-gnè are only partially open for steam-launches for about four months of the year. All the rivers are in high flood during the rainy season, but most of them subside in the dry weather. But the great delta of the Irrawaddy, extending from Rangoon to Cape Negrais, is always open to steamers and large country boats proceeding along the navigable creeks, aggregating some hundreds of miles in length. Until the introduction of railways, from 1877 onwards, inland transport of produce was, except on the Irrawaddy itself, mainly confined to the rainy season (May to November). Country boats carry up to about 120 tons.

The Koladan, Irrawaddy, Sittang, and Salween rivers all form broad fertile plains, and have rich deltas near the sea; though the total area of flat alluvial land hardly amounts to 50,000 sq. m., or between one-fourth and one-fifth of the total area

of Burma. But most of the rivers flood their banks in the wet summer season, and the Lower Irrawaddy and the Sittang inundate hundreds of square miles, except when prevented by earthen bunds from doing so. At Prome, 200 miles from the sea, there is a difference of 45 feet between the highest and lowest annual levels of the Irrawaddy; and where the open plains adjoining the delta begin, about 40 miles below that, the flood-waters inundate the villages and submerge the low-lying lands for about 10 or 12 miles on either side of the river-channel. But as the houses are built on wooden piles and the flow is not rapid, the villages are not destroyed, though the plough-cattle suffer greatly. Yet there are few large lakes in Burma. The three largest are the Indawgyi (Myitkyina district; area about 100 sq. m.), the Indaw (Katha; 60 sq. m.), and the Inlé (Yaukhwe Shan State).

Climate and Rainfall.—Throughout Lower Burma and in parts of Upper Burma heavy rainfall renders the climate moist and depressing for nearly half the year, and more trying for the European than is the climate of the plains of India; and owing to the swarms of mosquitoes, malarial fever is prevalent. Along the seacoast the average rainfall varies from 100 to 250 inches a year, and at Rangoon and in the delta it is about 90 to 100 inches, though much higher farther inland at Shwegyin on the Sittang; but as one ascends the Irrawaddy towards the centre of Burma, it rapidly decreases to about 45 inches at Prome and 40 inches at Thayetmyo, until a dry central zone is reached, extending across the country from 20° to 23° lat., where the rainfall is usually only from 20 to 30 inches a year, and where scarcity sometimes occurs through want of water, unless irrigation be provided. Beyond this the rainfall again increases, to about 60 inches at Katha, 80 to 90 inches at Bhamo, and more at Myitkyina. Thus parts near the seacoast or the densely wooded hilly tracts in the north have not only the greatest rainfall, but also the lowest temperature during the south-west or summer monsoon season (May to October). The north-east or winter monsoon only slightly affects the northern districts near Bhamo. The temperature varies as much as the rainfall. There are three seasons fairly well defined throughout most of the province—‘the cold weather,’ from November till February; ‘the hot weather,’ from March to May; and ‘the rains,’ from May or June to October and November. In Lower Burma, north of Rangoon, the thermometer ranges from about 54° during the night (in the forests) up to over 100° in the shade; but farther north, towards the central dry zone, the climate shows greater extremes of cold and heat, though the coldest nights are experienced in the districts lying to the north of the tropic of Cancer. Some Europeans prefer the damp equable climate of Lower Burma to the drier climate of Upper Burma with its dust and greater extremes of heat and cold, and greater differences between day and night. December, January, and February are pleasant months throughout the province; and even in the hot weather the nights are usually comparatively cool in Lower Burma. But during the rains, when the air there is saturated with moisture and a temperature of 87° is trying, the greater warmth of the dry zone is more easily borne, and is mitigated by a strong wind blowing continuously night and day from the south during July and August. At Maymyo, the summer headquarters of government, near the edge of the Shan plateau and about 35 miles east of Mandalay, frost is usual at night in December and January, and the hottest time is about the end of March, when the thermometer rises to 92° or 93°; but on rain then falling, the temperature falls, and seldom rises to 87° during the summer. Several small hill-

stations have been opened out, mostly on the hills to the east of the Irrawaddy.

Geology and Mineralogy.—The geological features of Burma vary greatly in different tracts, and all along Arakan and Tenasserim volcanic islands fringe the coast. The surface rocks in the interior consist mainly of Tertiary formations classed as follows: (1) *Irrawaddy System* (Pliocene, terrestrial, and fluvial), 20,000 feet; *upper series*, yellow friable sandstones, with beds of brown clay; no fossil bones, fossil wood scarce; *lower series*, yellow friable sandstones and conglomerates; much fossil wood, and bones. (2) *Pegu System* (Miocene, estuarine, and marine); *Yenangyaung series* (2400 feet), glauconitic sandstone and olive-green clays; *Prome series* (3100 feet), petroliferous sandstones, blue clays, and coal-seams. (3) *Bassein System* (Eocene, marine), 1200 feet, sandstones and shales capped by nummulitic limestones. (4) *Chin System* (undetermined), over 10,000 feet of unfossiliferous shales and limestones. In the Irrawaddy valley sandstones prevail, intersected with seams of quartz; and above the delta the soil is mostly sandy, while it is entirely alluvial in the delta and all the way along from Cape Negrais to the estuary of the Salween. Limestone prevails throughout many parts of the Shan Hills, and also occurs in the other ranges. Gold is found in the sand of numerous streams in different parts of the country, and in the gravel of the Irrawaddy in Upper Burma; but gold-dredging has not hitherto proved profitable. Jade and amber mines are also worked in the Myitkyina district by Chinamen, the yield being very variable. Rubies, spinels, sapphires, and moonstones are found around Mogok in the Ruby Mines district, where stiff clays overlying sandstone and marble predominate; but the washing and sifting of the gravelly matrix has not proved a profitable enterprise. Silver and lead occur extensively in the Southern Shan States, and silver, lead, tin, and wolfram in Tenasserim, but have hitherto been only sporadically worked. Coal has been found at several places in the hills on both sides of the Irrawaddy and in the Shan States, and has also been occasionally worked, but without much success. The white marble used for images of Gautama is quarried in the Sagyin Hills near Mandalay. Copper, mica, saltpetre, and antimony are found in small quantities, and lateritic iron is plentiful here and there; but by far the most important mineral product is the dark viscous petroleum yielded by the Yenangyaung oilfields in the Magwe district, and in the Myingyan and Pakokku districts on the Irrawaddy, in the southern portion of the dry central zone, and also found on the western side of the Arakan Yoma. The Upper Burma oilfields are by far the most important, and the only ones where gushing wells have been struck (at a depth of about 1100 feet), yielding a constant supply; while the crude oil is specially valuable on account of its high percentage of paraffin-wax. A pipe-line runs to refineries near Rangoon (250 miles).

Flora and Crops.—The chief crops are rice in Lower Burma, and millets, maize, peas and beans, sesamum, pulses, and ground-nuts in the drier areas of Upper Burma. Now that most of the best arable land has been appropriated, agrarian troubles are beginning; but they are not yet so acute as in most parts of India. Legislation is required to prevent capitalists (mainly money-lenders from Madras in Burma) becoming rack-renting landowners. Most of the forest area is hilly ground, unfit for ploughing. About 30,000 square miles have already been set apart as permanent ‘reserved forests,’ managed according to sanctioned working plans; but the state owns all the forests. In the reserves special attention is given to the regeneration and improvement of teak.

Owing to its climatic peculiarities, Burma is botanically by far the richest region of India. About 2000 species of forest-trees and large shrubs are already known, though many parts have not yet been systematically surveyed. Nearly 6000 species of flowering plants have been recorded under 161 natural orders, the following ten being dominant :



Buddhist Monks, with their Pupils.

Orchideæ, Leguminosæ, Gramineæ, Rubiaceæ, Euphorbiaceæ, Acanthaceæ, Cyperaceæ, Urticaceæ, Compositæ, and Scitamineæ. The proportion of monocotyledons to dicotyledons is about 1 to 2·3, and of genera to species 1 to 3·25. Burma is mainly a forest-clad country; and the forests themselves, both evergreen and deciduous, vary greatly in character, according to their elevation above and distance from the sea, their climatic and geological conditions, and the nature of the soil. The evergreen forests occur as 'littoral forests' on the estuaries and along the coast; 'swamp forests' on low alluvial parts; 'tropical forests,' containing *Thingan* (*Hopea odorata*), dipterocarps, palms, and bamboos, throughout the humid coast districts; 'hill-forests,' succeeding the tropical, above 3000 feet, and characterised by oaks, orchids, and pines (*P. Merkusii* in south, *P. Khasya* in north). The deciduous forests comprise 'dry open forests' on diluvial and older alluvial soil, characterised by *In* (*Dipterocarpus tuberculatus*) and other dipterocarps, with a few oaks, palms, and bamboos; 'dry tracts,' usually on calcareous soil, in which cutch or *Sha* (*Acacia catechu*), yielding the valuable brown dye, is one of the characteristic trees; 'mixed dry hill-forests,' in which the most valuable timber-trees occur—teak (*Tectona grandis*), ironwood (*Xylia dolabriformis*), *Padauk* (*Pterocarpus indicus*), &c.—above an undergrowth of bamboos, palms, and shrubs. The bamboo jungles often form impenetrable thickets when consisting of a small species (e.g. as in Arakan), but one of the commonest in the Pegu Yoma in Lower Burma, the *Kyathauing-wa* (*Bambusa polymorpha*), attains a height of 110 feet, and forms large, graceful clumps, standing wide apart. The giant among the bamboos is *Wa-bo* (*B. Brandisii*), with a diameter up to 10 inches and a height of 150 feet. Besides valuable timber, many trees yield varnish, wood-oil, tannin, dyes, gums, and fibres; while the Assam rubber-tree (*Ficus elastica*) occurs extensively in the northern Myitkyina forests, and extensive Para rubber

(*Hevea*) plantations have been made in the Mergui district (12° lat.). The orchids abounding in the forests mostly flower from March to May, and the forest trees from April to June. The chief fruit-trees are the mango, jack, tamarind, mangosteen, durian, and coconut.

Fauna.—Except in southern Tenasserim, which is really part of the Malay Peninsula, the Burma fauna belongs to the class prevailing also in Assam and the forest-clad Himalayas. Buffaloes and oxen are domesticated, and ponies, pigs, goats, geese, ducks, and fowls. Even elephants readily breed in captivity in Burma. The forests have wild elephants, bison, wild cattle and deer, tigers, leopards, rhinoceros, bears, apes, and monkeys. There are crocodiles in the rivers. Big-game shooting can easily be had, but it takes time and trouble, as the forests are so vast and dense. A license is necessary for shooting in reserved forests. The chief danger is fever. Among the game-birds are snipe, teal, wild-geese, pea-fowl, pheasants of various kinds, &c. Snakes of all kinds abound, especially during the rains, and the lamadryad or king-cobra, the most dangerously aggressive of Indian snakes, is occasionally met.

The variety of birds and of fishes is much greater than in any other part of India; and the fish caught along the coast, and in the inland fisheries left after the flood-waters recede, contribute largely to the food of the people, especially in the form of *gna-pi* or salted condiment, taken with curry and rice. In the inland tracts the lakes gradually dry up in the hot season, and the fishes remain dormant in the soil until revived by heavy rainfall in late spring; and this has given rise to the superstition that the fish are brought down in the rain. Though prohibited by their religion from killing, the Burmese eat almost any kind of fish, flesh, and fowl; and among delicacies found on the seacoast and the islands are turtles' eggs, and in the Mergui Archipelago the edible birds'-nests prized by Chinese.

Ethnology and Population.—The Burmese belong to the Mongoloid type prevailing from the Himalayas to Burma, and characterised by having a broad head, brown skin of varying shades, scanty hair on face, shortish stature, face flat, and eyelids occasionally oblique. They closely resemble the Siamese. They are law-abiding, but excitable and impulsive, fond of gambling, pony and boat racing, gay raiment, and theatricals. Their religion makes them averse from killing, but they have plenty of courage, though they despise drill. There is no caste among them, and no aristocracy, and there are no large landowners. The women have as much personal freedom as in any other country in the world. Though nominally, from a religious point of view, considered inferior to men, women often rule their husbands and families, and they have equal rights with men regarding marriage, divorce, remarriage, and partition of property. The men are good agriculturists, but the women far surpass them in business instinct and trading capacity. All wear gay silk clothing, and spend their earnings freely, seldom hoarding, and then usually in the shape of solid gold ornaments, upon which temporary loans can easily be raised if necessary. The general level of prosperity and

the standard of comfort are far higher than in India, and there are few poor, as employment is almost everywhere abundant, and at wages considerably above those obtaining in India. The staple food is rice, with fish and meat or vegetable curries; and livelihood is easy, owing to the rapid development of the province and the quantity of cultivable land still available at a moderate land-tax. The Shan tribes on the eastern hills are clearer in complexion than the Burmese, and peaceful in disposition, as are also the Karen hill-tribes in Lower Burma, many of whom have embraced Christianity; but in the mountainous tracts of Upper Burma the Chins on the west and the Kachins on the east are wild, savage, turbulent tribes, formerly much given to raiding and fighting. The census of 1911 may be thus summarised:

	Males.	Females.	Total.
For whole province...	6,183,494	5,931,723	12,115,217
Burma proper.....	5,432,715	5,177,541	10,610,256

The rural population totalled respectively 10,987,242 and 9,482,281 against an urban population of 1,127,975 entirely in Burma proper. Rangoon, the chief city, contained 293,316 souls (208,111 males and 85,205 females), of whom 108,350 were Hindus by religion, 97,467 Buddhists, 54,634 Mohammedans, and 23,044 Christians. Rangoon is more an Indian than a Burman town, and many of the Indian immigrants are mill employees. As regards language and religion, the 1911 returns for the province are:

Language.	Religion.
Burmese.....	7,883,299
Arakanese.....	323,962
Shan.....	968,375
Karen.....	1,067,363
Bengali.....	248,310
Chin.....	295,283
Món or Peguan.....	346,120
Hindi.....	184,882
Kachin.....	169,414
Tamil.....	125,670
Telugu.....	123,162
Chinese.....	108,877
Others.....	269,770
Total.....	12,115,217
	Religion.
Buddhists.....	10,384,579
Animists.....	701,473
Mohammedans.....	420,777
Hindus.....	389,679
Christians.....	210,061
Sikhs, Jews, Jains, Parsis, and Confucians.....	8,583
Secularists, Rationalists, and Agnostics.....	45
Total.....	12,115,217

Over two-thirds were engaged in agriculture, and only two cities—Rangoon and Mandalay—contain over 100,000 inhabitants. Pop. (1921) Burma, 13,205,564; Rangoon, 339,527; Mandalay, 147,429.

Religion.—The Burmese are Buddhists, and Burmese Buddhism is the purest form extant; yet there is generally underlying this professed religion a very deeply felt and strong belief in the power of unseen spirits. The highest form of the religion is that practised by the *pôn-gyi* or monks, vowed to poverty and celibacy, who shave their heads, wear yellow robes, reside in monasteries in or near all the towns and villages, and are much respected and supported by voluntary food-offerings daily made by laymen. But they can cast aside their yellow robe if tired of monastic life, and return to the world of laymen. They are the teachers in the jungle districts, instructing little boys in reading, writing, and simple arithmetic. In 1911 there were over 128,000 monks, probationers, and acolytes; and every male Burman must spend some time (even if only a nominal period) as a 'religious' in a monastery. The hierarchy includes an archbishop (*Thathanābaing*) and bishops (*Sadāw, Gaing-ōk*), who supervise the monasteries and monks, religious discipline, and education.

Language and Literature.—The Burmese language belongs to the Tibeto-Burman branch of the Tibeto-Chinese languages. It has many local dialects, of which the most important is Arakanese. Burmese is 'agglutinative' and tonal, and is written from left to right in characters derived from the ancient square Pali, but now formed in circular and

curved lines. The alphabet consists of thirty-one consonants and ten vowels, some of the consonants forming simple sounds, like *k, p, b, d*, and others being aspirated forms, like *kh, ph, bh, dh*, while diacritical marks indicate the tone and emphasis to be put on the syllable. Colloquial, court and official, and literary styles are distinguishable; but even the simplest of these is difficult, and the number of really good Burmese scholars is small among Europeans. A peculiarity of Burmese is the addition of generic terms in indicating objects—e.g. one man, *lu-ta-yauk* (man one person); two monks, *pôn-gyi-hnit(hni)-bá* (monk two venerable objects); three elephants, *sin-thôn-si* (elephant three things to ride); four buffaloes, *kywè-le-gauing* (buffaloes four beasts); and so on, with many other generic affixes indicating different ideas as to shape and other characteristics. From time immemorial Burmese has been a written language, the literature being handed on from generation to generation in the form of palm-leaf manuscripts, held together by bamboo pegs to form volumes enclosed between wooden covers. Printing was only introduced during the last century, after the annexation of the maritime provinces in 1826. Burma possesses two kinds of literature—the ancient Pali books, dealing exclusively with religious subjects, in metrical sections or verses; and the modern Burmese works, also for the most part metrical, and consisting of religious romances of two kinds (*Zat* and *Wuttú*), the royal chronicle (*Yazawin*) of Burmese history, and songs. The old palm-leaf manuscripts and royal records are beautiful specimens of calligraphy; but now the printing-press issues much religious and secular literature.

The grammar of the language is very simple. The difficulties of Burmese grammar are due to mistaken endeavours to assimilate Burmese to Pali, from which its way of writing was taken. The popular language is more like Chinese, which also has equally little grammar. A good ear and a good memory suffice to make a colloquial command of Burmese easy. It is called difficult by Englishmen because they naturally compare it with Hindustani, the easiest language in the world; but it is easy compared to any language in Europe.

History.—The earliest incursion of the progenitors of those now forming the Burmese nation is supposed to have come from the Central Asian highlands; but the first great epoch began with King Anawrata's reign at Pagán, in Central Burma, about 1010 A.D. Anawrata led captive the last king of Thátôn, and took all the sacred books. Pagán then became the religious and political centre of a great united Burma. This was the kingdom of 'Mien,' mentioned by Marco Polo, who describes the invasion of southern China by the army of the king of Mien (i.e. Burma) in 1272. The defeat in China of the Burmese invaders was followed by a successful invasion of Burma by the Chinese or Tatars, who took and sacked Pagán, which has ever since been a deserted city of ruins, as it is to-day. For centuries to follow, as in the centuries preceding the rise of the great kingdom of Pagán, Burma was divided into small states independent of each other. At last, in the middle of the 18th century, the Peguans (Lower Burmans) successfully invaded Upper Burma, and Ava, the northern capital, was sacked and burned. The Upper Burmans rallied under a villager known to history as Alompra. He first reconquered Upper Burma and then Pegu and Tenasserim, and having thus united all Burma under his sway, died while invading Siam. A successor brought Arakan and Manipur under the power of Burma, and his dynasty endured to our own day, the last king of Burma, Thibaw, for many years a state prisoner in India, being descended from him. Various Chinese

invasions were easily repelled by the Burmese. Siam was successfully invaded, and the Shan States in the hills between Burma and Siam were retained in subjection. Then the Burmese invaded British India in 1824, and the first Burmese war followed. In Chittagong the Burmese had a small victory, and they held the British troops in check in Assam; the British sent an army to Rangoon, and up the Irrawaddy the British army went, with enormous losses from disease, but victorious at every point, and in 1826 the Burmese made peace, when the invaders were at Yandabo, about 50 miles from Ava, the capital. In the settlement then Arakan—i.e. the coast province from the Bengal boundary down to Cape Negrais—and Tenasserim were ceded to Britain. The Burmese soon worried the British representatives into going away, and in 1852 the second Burmese war between Burma and British India began. The population of Lower Burma welcomed the British, preferring them to the Upper Burmans, and in 1852 Lower Burma was annexed to the Indian Empire. The new Burmese king (1853) was King Mindón. He bargained with the British, treated traders well, entertained a British resident at Mandalay, his new capital, and abstained from provoking hostilities. During the Indian Mutiny (1857–58) Burma kept quiet. In 1879 Mindón died, and was succeeded by his son Thibaw, who massacred his brothers, sisters, and relatives. The British resident protesting against these barbarities, his position at Mandalay became perilous, and he was recalled. From 1880–85 unfriendliness was shown in many ways, by infringing the terms of the existing treaty, arranging to give to France a preponderating influence on the Upper Irrawaddy, and imposing a fine of £250,000 on a British company. The Mandalay government refusing redress, in October 1885 an ultimatum was sent, the terms of which were ignored; and early in November King Thibaw published a proclamation calling all Burmans to drive the British into the sea. On the 15th November a British force crossed the frontier and steamed up the Irrawaddy, little resistance being made. On 28th November the Burmese troops surrendered at Ava; Mandalay, with the palace, fort, and arsenal, was occupied; and Thibaw was deported to India. Early in 1886 Upper Burma was annexed to British India. Guerilla warfare was waged, but by 1890 the country was pacified.

Administration and Finance.—In 1897 Burma was raised from a chief-commissionership to a lieutenant-governorship, the seat of government being Rangoon (with hot season headquarters at Maymyo, near Mandalay). In 1922 it was made a governorship, and a diarchical system of government was introduced similar to that already set up in other provinces of India. The franchise was conferred on a larger proportion of the population than in the other provinces; and the women's vote was proportionally large. Burma is divided into eight divisions under commissioners (four for Upper Burma with Shan States and Chin Hills, and four for Lower Burma), assisted by six divisional sessions judges, and thirty-nine districts under deputy-commissioners, assisted by eight district judges. The districts form the units of administration, and are parcelled into subdivisions and townships under European and Burman magistrates. Each village tract (*ywa*) has a headman, vested with petty police and revenue powers. The Shan States are administered by their chiefs, under the supervision of two superintendents. Civil and criminal justice is controlled in Lower Burma by a chief court with five judges, and by a judicial commissioner in Upper Burma. The revenue administration is under a financial commissioner, who also controls the customs and excise, settlement, land records, agri-

culture, and veterinary departments. Financial relations with India are regulated by a 'provincial settlement,' renewed every five years. Law and order are maintained by a strong civil and railway police-force commanded by Europeans, an equally strong military police, and a garrison.

Vacant land is acquired direct from the state, and held on payment of land-tax, as determined by a land settlement made (usually for fifteen years) after survey and crop measurements. The cultivated area is some 20,000,000 acres, over 15,000,000 acres being actually cropped (of which about 1,250,000 acres are artificially irrigated).

Communications.—There are 2000 miles of metalled and 11,000 miles of unmetalled roads, and 1527 miles of railway open; but the more rapid development of Burma by means of public works, including also irrigation canals in Upper Burma and embankments in Lower Burma, &c., is retarded for financial reasons. Since 1897 the railways, all of metre gauge, have been worked by the Burma Railway Company. Besides the main trunk-line from Rangoon to Mandalay and Myitkyina, with numerous branch-lines, Rangoon is now linked with the seaports Moulmein and Bassein; and it is only a question of time and funds when the Burma railways will meet those in China and eastern Bengal. River-steamer traffic is mainly in the hands of the Irrawaddy Flotilla Company, which has a great fleet of boats of many sizes and kinds, including large and luxurious river-steamers.

Trade and Commerce.—Of the four chief seaports (Akyab, Bassein, Rangoon, Moulmein), Rangoon is by far the largest, and most of the trade passes through it. Besides a very large coasting trade, there is also a growing overland trade with China and Siam. The chief export is rice; others are teak and petroleum; then cutch, hides, cotton, and ground-nuts; and the chief imports are cotton goods and yarns, silk, salt, coal, hardware, and metals.

Education.—In 1852 the percentage of illiteracy in Burma was lower than anywhere else in Asia or in most parts of Europe, owing to the indigenous vernacular education given gratuitously by the monks in the monasteries or for small fees in the indigenous schools in the villages. From the administrative point of view, education is classed as vernacular and Anglo-vernacular, the latter being wholly under the supervision of the government Education Department, while the former is only partially supervised, as many monastic schools have not yet conformed to the departmental rules and sought registration. Missionary and all other schools under government inspection receive grants, and unregistered schools obtain no assistance. All boys have, as part of their religion, to spend some time at a monastery; hence there are few illiterates among the male Burmese. Girls are not admitted to these monastic schools, but are often taught with boys in lay schools; and girls' schools are gradually being established. The Educational Code is revised every five years, and government is assisted by an educational syndicate. The university of Rangoon, founded in 1920, has two constituent colleges, University College and Judson College.

Arts and Manufactures.—These consist chiefly in wood and ivory carving, boat-building, repoussé silver-work, cotton and silk weaving, bamboo lacquer-ware, and gold jewellery. Both in wood-carving and silver-work the designs are bold and artistic, though the execution is often rough. Mandalay palace and many monasteries are richly decorated with carved teak, often gilded, and looking-glass mosaic in many colours; and the high sterns of large river-boats, made of a dug-out hull with planked sides, are also carved. Through contact with Western

civilisation the hereditary skill in all branches of art is rapidly being impaired and lost. Gesso-work was formerly frequent on boxes containing sacred writings. Marble and brass images of Gautama are chiefly made near Mandalay. A great many rice and wood mills and oil-refineries have been set up, so that the rice and teak and oil are now exported fit for immediate use. The extension of the Indian salt-tax to Burma has killed the salt industry, and handloom-weaving and silk-making are diminishing.

Architecture and Archaeology.—Except in the large towns, where masonry buildings roofed with shingles, tiles, or corrugated iron are now common,



Shway Dagon Pagoda at Rangoon.

the houses are mostly built of wood or bamboo, and thatched with coarse grass or split bamboo. Like ancient lake-dwellings, they are almost invariably raised on posts or piles, so that the open veranda in front (when there is one) may be about 2 feet above the ground, while the main part, containing the sleeping-rooms, is usually 10 or 12 feet above ground. The houses are often one-storied, as the Burman dislikes the idea of any one walking over his head. The roofs are high-pitched, with projecting eaves. Rich Burmans spend large sums in building and ornamenting monasteries (*kyaung*), rest-houses (*zayát*), and pagodas (*payá*); though minor works, like bridges, roads, tanks, &c., are also meritorious. The monasteries are mostly built of teak, with three, five, or seven tiered spire-like roofs, and are often richly carved and ornamented. Every town has several, and hardly any small village is without its own monastery. The modern bell-shaped pointed pagoda, often richly gilded, and always crowned with a metal *ti* ('umbrella'), is seen everywhere, especially on knolls. The largest and most famous is the Shway (Shwe) Dagon at Rangoon; though other celebrated ones are at Syriam, Pegu, Prome, Mandalay, Moulmein, and elsewhere. By far the finest specimens of modern Burmese architecture are to be found in and around Mandalay, and include the palace, with a lofty wooden spire, the *Mibayá* or Queen's monastery,

Thibaw's monastery, the '10,000 pagodas,' and many other beautiful works. In 1908 an Ancient Monuments Preservation Act was passed, and an archaeological survey afterwards drew up lists of historic and architectural monuments for preservation. The richest archaeological and religious historical remains are found at Pagan in Central Burma, where the oldest pagodas, plainly indicating Indian influence, date from 1050 to 1218 A.D.

Sangermano's *Burmese Empire* (1833; 2d ed. 1885) and Symes's *Embassy to Ava* (1795) are the best early books. There are handbooks and descriptive books by Forbes (1876), Fyche (1878), Mason (1883), Cuming (1893-96), Parker (1892), Bird (1897), Ferrars (1900), Nisbet (1901), Scott (1921), O'Connor, and others. See also histories by Sir A. Phayre (1884) and L. W. Shakespear (1914); Sir J. G. Scott's ('Shway Yoe's') *The Burman, his Life and Notions* (1882); H. Fielding Hall's *Soul of a People* (1898) and *A People at School* (1906); Pollok and Thom's *Wild Sports* (1900); D. A. Wilson's *East and West* (1911); Dautremer, *Burma under British Rule* (trans. 1913); Sir C. Crosthwaite, *The Pacification of Burma* (1913); and for Burmese, *Judson's Dictionary*.

Burmans, a Dutch family of scholars, originally from Cologne.—(1) Peter 'the elder,' born at Utrecht in 1668, studied law at Utrecht and Leyden, and next travelled through Germany and Switzerland. At first an advocate, he became professor of History and Rhetoric in the university of Utrecht, afterwards of Greek at Leyden, where he died in 1741. In his literary career, his hot temper and intolerant spirit involved him in many controversies, often with adversaries like Le Clerc and Bentley. His chief works are editions of the Latin classics, in stately quartos, with extensive notes often dreary and tasteless to a degree.—(2) Peter 'the younger,' nephew of the preceding, born in 1714 at Amsterdam, made his studies at Utrecht, and became in succession professor at Franeker, professor at the Amsterdam Athenæum, and keeper of the public library there. He retired in 1777 on a pension, and died the year after. He edited Virgil, Aristophanes, Claudian, and Propertius, and an anthology of the Latin epigrammatists; but his editions are now little valued.

Burmanniaceæ, a small family (about 60 species) of plants, which seem to link the orchids with more typical monocotyledons. They are found in tropical forests in both hemispheres, especially in Borneo and New Guinea, and extend northwards as far as the Southern United States. They are small plants, many of them saprophytes without green colouring-matter. The six perianth-leaves are united in the form of an urn, which may be regular, or swollen so as to bring the mouth to one side. The free ends are often needle-like, sometimes all of them, sometimes three, sometimes five, with the sixth large and wide. The stamens (3 or 6) are often doubled back inwards against the perianth-wall, and are curiously expanded.

Bur-marigold (*Bidens*), a widely distributed genus of composite annuals.

Burnaby, FREDERICK GUSTAVUS (1842-85), son of a clergyman who was also squire of Somersby Hall in Leicestershire, became colonel of the Royal Horse Guards Blue, served with Gordon in the Sudan, made and described his adventurous *Ride to Khiva* in 1875, and a less famous journey in 1876 *On Horseback through Asia Minor*, and was killed by an Arab spear-thrust in the battle at Abu Klea in the Nile expedition of 1884-85.

Burnand, SIR FRANCIS COWLEY (knighted in 1902), was born 29th November 1836. He was educated at Eton and Trinity College, Cambridge (1854-58), and afterwards went to Cuddesdon Theological College with a view to becoming a clergyman of the Church of England. In December 1858 he joined the Catholic Church, and for

four months continued his studies at the house of the Oblate Fathers at Bayswater. His first farce had been produced at Eton in 1851, and at Cambridge he had founded the 'A.D.C.', of which he published a *History* in 1879. He was called to the bar in 1862, but the success of some early dramatic ventures altered his plans. He produced between eighty and a hundred pieces, chiefly extravaganzas and burlesques; four dramas; and some very successful comedies. He joined H. J. Byron in starting *Fun*, but left that paper for *Punch*, then edited by Mark Lemon, in 1863. His first contribution to *Punch* was *Mokeanna*, a burlesque on sensational romance writing; soon after appeared *How, When, and Where*, followed by the now well-known *Happy Thoughts*, which in book form soon ran many editions. Later he continued the *Happy Thoughts* series, and wrote a succession of burlesques of popular novelists, that on Ouida's style, *Strapmore*, being perhaps the happiest. He was editor of *Punch* from 1880 till 1906. He wrote the libretto for Sullivan's *Chieftain* (1894), and in 1903 published his *Reminiscences*. He died 21st April 1917.

Burne-Jones, SIR EDWARD, was born at Birmingham, of Welsh descent, 28th August 1833. He was destined for the church, and educated at Exeter College, Oxford, where William Morris, the poet, was his friend; but his thoughts turned strongly to art; and having, about 1857, submitted some pen-drawings to Rossetti, whose work had powerfully influenced him, he received from this artist encouragement and guidance in his first attempts as a painter. His subjects were always poetical and imaginative. From the first he was a fascinating colourist, and his earlier works, as 'The Merciful Knight' (1864), 'Merlin and Vivien', the figures of the two heroines of Meinhold's *Sidonia* and 'The Wine of Circe' (1867), along with much medieval quaintness both in form and feeling, possess great expressional intensity. They attain, in water-colour, greater brilliancy and purity of hue than is usual even in works executed in oil, and are sometimes, as in 'Love among the Ruins' (1873), on such an extended scale as we usually associate with the more dignified medium. About 1870 he began to be known as an oil-painter, and his works of this period are inspired by the earlier art of the Italian Renaissance, and show more of grace and less of emphasis than his former paintings in body-colour. Among his pictures are, 'The Days of Creation', 'The Beguiling of Merlin', and 'The Mirror of Venus' (1877); 'Laus Veneris' (painted 1873-75), 'Le Chant d'Amour' and 'Pan and Psyche' (1878); 'The Golden Stairs' (1880); 'The Tree of Forgiveness' (1882); 'The Wheel of Fortune' (1883); 'King Cophetua' (1884); 'Andromeda Chained', 'The Fight with the Sea-beast', and 'The Brazen Tower' (1888); and the 'Legend of the Briar Rose' pictures (four, 1890). He became D.C.L. in 1881, A.R.A. in 1885 (resigned 1893), and a baronet in 1894. Several of his latest works show a realism and a thoroughness of draftsmanship and modelling in his treatment of the nude unknown in his former productions; but his colouring tended on the whole to become less splendid. He furnished many striking designs for stained glass—as for Christ Church, Oxford. In 1898 'Love and the Pilgrim' sold for 5000 guineas. He died 17th June 1898.

See monograph by Malcolin Bell (1892); the biography by his son-in-law, J. W. Mackail (1900); and the *Memoirs* of him by his wife (1904).

Burnes, SIR ALEXANDER, was born in 1805 at Montrose, in Forfarshire, where his father was provost. (The provost's father was the cousin of Robert Burns). In 1821 he entered the Indian

army, and his knowledge of oriental languages gained him rapid promotion. After performing some important missions for the Indian government, he was, at his own suggestion, sent on a twelve-months' expedition into Central Asia. Starting from Lahore in 1832, and adopting the Afghan dress, he passed through Peshawur and Kabul, and crossed the Indian Caucasus to Balkh. Thence he passed on to Bokhara, Astrabad, and Teheran, and journeying through Ispahan and Shiraz, reached Bushire on the Persian Gulf, whence he embarked for India. On his return to England in 1833, he was received with high honours; and in September 1839, having previously been knighted and promoted to the rank of lieutenant-colonel, he was appointed political resident at Kabul, where he was murdered by the Afghan mob, 2d November 1841. See his *Travels into Bokhara* (1834), and *Kabul* (1842); and Kaye's *Lives of Indian Officers* (1869).

Burnet, GILBERT, Bishop of Salisbury, was born at Edinburgh, 18th September 1643. At the age of ten he entered Marischal College, Aberdeen, and, four years later taking his M.A., applied himself to the study first of law and then of divinity, with such diligence and success that in 1661 he was admitted a probationer. In 1663 he visited Cambridge, Oxford, and London, where he met with many of the leading divines of England; and next year passing over into Holland, perfected his knowledge of Hebrew under a learned rabbi of Amsterdam. In 1665 he became minister of Salton, Haddingtonshire; in 1669 professor of Divinity in Glasgow University; but in 1674, having brought on himself the enmity of his old patron Lauderdale, he found it prudent to resign his chair, and settle in London, where he was made chaplain to the Rolls Chapel, and afterwards lecturer at St Clement's. In 1677 he published his *Memoirs of two Dukes of Hamilton*; in 1679-81 the first two volumes of his *History of the Reformation*, which procured him a vote of thanks from parliament; in 1680 *Some Passages in the Life and Death of the Earl of Rochester*; and in 1682 his *Life of Sir Matthew Hale*. The efforts which had previously been made were now repeated to induce him to break with the liberal and moderate party, and to attach himself to the king. He was offered the bishopric of Chichester, but refused it. In 1683 he attended the execution, and vindicated the memory, of his friend Lord William Russell. The king exhibited his unkindly spite by depriving Burnet of his lectureship; and on James's accession he went to the Continent, and travelled through France, Italy, Switzerland, and Germany. In 1684 he was introduced to the Prince of Orange, with whom he became a great favourite, and by whom he was frequently consulted in reference to the great scheme for the deliverance of England. When William came over, Burnet accompanied him as royal chaplain, and in 1689 was appointed Bishop of Salisbury. He entered on the duties of his diocese with great ardour; but his first pastoral letter, in which he founded William's right to the throne on conquest, gave so much offence to both houses of parliament, that they ordered it to be burned by the common hangman. In 1698 he was appointed preceptor to the Duke of Gloucester; in 1699 he published his celebrated *Exposition of the Thirty-nine Articles*, which was condemned as heterodox by the Lower House of Convocation. In 1714 appeared the third volume of his *History of the Reformation*; and on 17th March 1715 he died at Clerkenwell of a pleuritic fever. He was thrice married; his first wife was remarkable for her beauty, the second for her fortune, and the third for her piety. Not until 1724-34 did Bishop Burnet's *History of my Own Time* make its appear-

ance—a work that was sarcastically but foolishly abused by Swift, Pope, Arbuthnot, and other Tory writers of the day. A Whig and broad churchman, Burnet was a man of strict, almost puritanical virtue, of marvellous charity, geniality, and moderation. His style is often harsh, his judgment not always reliable, yet the honesty, earnestness, simplicity, and vigour of his writings, as well as their fullness of details, make his works very valuable to the student of history. See the Clarendon Press editions, and the exhaustive and admirable *Life* by T. E. S. Clarke and Miss Foxcroft (1907).

Burnet, JOHN, painter, engraver, and author, was born at Fisherrow, near Edinburgh, in 1784, and died at Stoke Newington, 29th April 1868. He first became known through his admirable engravings of Wilkie's works. Of his own paintings the best known is the 'Greenwich Pensioners' (1837). He wrote several books on art, the most important being a *Practical Treatise on Painting*; and he was also author of *Rembrandt and his Works* (1849), and, in conjunction with Cunningham, of *Life and Works of Turner* (1852).

Burnet, THOMAS, born in Yorkshire about 1635, studied at Cambridge, and in 1685 was elected Master of the Charterhouse. He succeeded Archbishop Tillotson as clerk of the closet to William III., but having in 1692 published a work, *Archæologia Philosophica* (also in English), displaying great learning, but treating the Mosaic account of the Fall as an allegory, he was obliged to retire from the clerkship, and lived in the Charterhouse till his death in 1715. His *Telluris Theoria Sacra* (1680-89) was written in Latin, and rewritten by himself in English. It is speculation, not science; cosmogony, not geology; he holds that horrid mountains and protuberances are the result of the Deluge. In a work on the future life, he strongly repudiated the doctrine of eternal punishment: 'Be assured the time will come when the doctrine of eternal torments will be not less odious than the doctrine of transubstantiation is now among Protestants.'

Burnet, the English name of two closely



1, Common Burnet (*Poterium Sanguisorba*);
2, Great Burnet (*Sanguisorba officinale*);
a, a floret; b, flower-head.

allied and often united genera of Rosaceæ—*Poterium* and *Sanguisorba*.—Great Burnet (*Poterium*

[*Sanguisorba*] *officinale*) is common in meadows in all parts of Europe. It is cultivated in Germany on poor soils for fodder. The root-stock is astringent, and was formerly used in medicine.—Common Burnet (*Poterium Sanguisorba*) grows in dry pastures, especially on chalky soils, on which it sometimes becomes of importance, and has also been cultivated as a fodder plant. It grows wild in the United States. It used to be cultivated in gardens, its slightly astringent leaves being used in salads or soups, also as an ingredient in cool tankard (the name *Poterium* being from a Greek word signifying a drinking-vessel). *S. Canadensis* is an interesting American species, sometimes cultivated in gardens.

Burnet-saxifrage (*Pimpinella Saxifraga*) is an umbelliferous plant, which, on account of its similar foliage, habit, use as fodder, and (more distinctly) astringent root-stock, has been associated or confused with burnet from the earliest times.

Burnett, FRANCES HODGSON, novelist, was born at Manchester, November 24, 1849. About the close of the American civil war she emigrated with her parents to the United States, and settled in Tennessee. She married Dr Burnett in 1873, and after a lengthened tour in Europe, settled in Washington. She had early begun to write, but her first great success was her story, *That Lass o' Lowrie's*, which, after running through *Scribner's Magazine*, was issued at New York in 1877. Her second story, *Haworth's*, appeared in 1879. Both were novels of no common power, studies of Lancashire manufacturing life. *A Fair Barbarian* (1882) and *Through One Administration* (1883) were later novels; *Louisiana* (1880) and *The Little Unfair Princess* (1902) were admirable minor tales; *The one I knew best* (1893) is autobiographical; *A Lady of Quality* (1896), *His Grace of Ormonde* (1897), and *The Dawn of a To-morrow* (1907) are novels. *Little Lord Fauntleroy* (1886), a very charming story of child life, was her best-known work; as dramatised by herself, it had brought the author over £20,000 by 1910. Other plays are *Phyllis*, *The Showman's Daughter*, *The First Gentleman of Europe*, and *Esmeralda*.

Burnett, JAMES. See MONBODDO.

Burnettising. See TIMBER.

Burnett Prizes, founded by bequest of John Burnett (1729-84), an Aberdeen merchant, to be bestowed on the authors of the two best treatises on 'The evidence that there is a Being all-powerful, wise, and good, by whom everything exists; and particularly to obviate difficulties regarding the wisdom and goodness of the Deity; and this independent of written revelation' of any kind. On the first competition in 1815, 50 essays were given in; and the judges awarded the first prize, £1200, to Dr W. L. Brown, Principal of Aberdeen University; the second, £400, to the Rev. J. B. Sumner, afterwards Archbishop of Canterbury. In 1855, 203 essays were given in; and the first prize, £1800, fell to the Rev. R. A. Thompson, for an essay entitled *Christian Theism*; the second prize, £600, to Dr Tulloch, afterwards Principal of St Mary's College, St Andrews, for an essay on *Theism*. The four essays were published. The fund has since been applied to found a lectureship on some branch of science, history, or archæology, illustrative of natural theology. The first lectures under the new scheme, *On the Nature of Light*, were delivered at Aberdeen, in November 1883, by Professor Stokes of Cambridge, and published in 1884.

Burnett's Disinfecting Liquid is a liquid introduced by Sir William Burnett (1779-1861) for the purpose of deodorising the bilge-water of ships, sewage-water, &c. It is a strong solution (sp. gr. 2)

of chloride of zinc, accompanied by a small amount of chloride of iron; and when intended to be used, it is mixed with water in the proportion of one pint to five gallons of water. The liquid acts only as a *deodoriser* and *antiseptic* (see ANTISEPTICS), and does not yield any vapour which can exhibit the properties of a Disinfectant (q.v.). It is of service in preserving dead animal tissues, as in the dissecting-room, and in jars containing anatomical specimens. It is said to have little action on dissecting knives, but this is doubtful. When added to bilge or sewage water, the chloride of zinc, $ZnCl_2$, mainly acts by decomposing the offensive sulphide of ammonium, NH_4HS , which it does by forming the sulphide of zinc, ZnS , and chloride of ammonium, NH_4Cl , both of which are odourless. The strong solution of chloride of zinc has also been applied to the preservation of timber from the ravages of dry-rot, and the process of so treating wood is called, after its inventor, *Burnettising*. *Crewe's* disinfectant liquid is chemically the same as the above.

Burney, DR CHARLES, musician and author, was born in 1726 at Shrewsbury, and having studied music there, at Chester, and under Dr Arne in London, he commenced giving lessons in music himself. After composing three pieces—*Alfred*, *Robin Hood*, and *Queen Mab*—for Drury Lane (1745–50), he settled as organist at Lynn, in Norfolk (1751–60), where he planned his work on the *History of Music*, published 1776–89. In 1770–1772 he travelled in France, Italy, Germany, and Austria, collecting materials for it. Beside minor works and accounts of his two tours, Burney wrote a *Life of Metastasio*, and nearly all the musical articles in *Rees's Cyclopaedia*. In 1783 he became organist to Chelsea Hospital, where he died 12th April 1814. He knew intimately many of the most eminent men of the day, including Burke, Johnson, Reynolds, and Garrick. See the *Life* (1832) by his daughter, Madame D'Arblay (q.v.).—His son, CHARLES BURNEY, D.D. (1757–1817), was a schoolmaster and classical critic. His fine library was purchased for the British Museum.

Burney, FANNY. See D'ARBLAY.

Burnham Beeches, the remains of an ancient forest in Buckinghamshire, 25 miles W. of London. The London corporation purchased the surrounding 374 acres in 1879, and set them apart for public use, 3rd October 1883. The poet Gray, early in the 18th century, first called attention in his letters to the wild woodland. Many of these beeches have been, and still are, of immense size. Mr F. G. Heath, who was the first to urge their acquirement for public use, has described them in *Burnham Beeches* (1880).

Burning, CHEMISTRY OF. See COMBUSTION. FOR BURNING-GLASSES; see HEAT, LENS, MIRROR. FOR EXECUTION, CAPITAL PUNISHMENT.

Burning Bush (*Euonymus atro-purpureus*) is a small ornamental shrub of North America, with oblong leaves, deep purple flowers, and scarlet smooth capsules; its congener, *E. americanus*, has scarlet prickly capsules. The French *Buisson ardent* is a red hawthorn (*Crataegus Pyracantha*).

Burnley, a thriving town of Lancashire, in a narrow vale on the banks of the Brun, near its influx to the Calder, 21 miles E. of Preston, and 27 N. of Manchester. A great seat of the woollen and then of the cotton manufacture, it is a modern, well-built place, with a literary institute and exchange (1855), a market-hall (1868), the Victoria Hospital (1886), a grammar-school (*temp.* Edward VI.), and an ancient parish church, restored in 1856. Besides numerous cotton-mills, it has calico-printing works, iron and brass foundries, machine-shops, breweries, tanneries, and rope-works. There are collieries in the vicinity. Burnley was created

a municipal borough in 1861, a parliamentary borough (returning one member) in 1867, and a county borough in 1888. A Roman way passed through the town, and Roman remains have been found. Pop. (1871) 44,320; (1881) 63,638; (1911) 106,765; (1921, in holiday season) 103,175.

Burnouf, JEAN LOUIS, French philologist, born at Urville, 14th September 1775, became professor of Rhetoric at the Collège de France in 1817, and subsequently in succession inspector of the university, general director of studies, and librarian. Elected a member in 1836 of the Académie des Inscriptions, he died at Paris, 8th May 1844. He was the author of grammars of Greek and Latin, which have gone through numerous editions, as well as an excellent translation of Tacitus.—EUGÈNE, a great orientalist, son of the preceding, born at Paris, 1st April 1801. He first studied law, but soon devoted himself, under Abel Rémusat and Chézy, to the oriental languages, especially those of India and Persia. In 1832 he became a member of the Académie des Inscriptions, and in the same year succeeded to Chézy's chair of Sanskrit at the Collège de France, which he filled until his death, at Paris, 28th May 1852. His first works were his *Essai sur le Pali* (1826), written in conjunction with Lassen of Bonn, and *Observations Grammaticales sur quelques Passages de l'Essai sur le Pali* (1827). His next task was the deciphering of the Zend manuscripts brought to France by Anquetil Duperron. He commenced by publishing a splendid lithographed edition of the *Vendidad-Sadé*, the most important part of the *Zendavesta* (1829–43), and published from time to time in the *Journal Asiatique* the brilliant results of his laborious studies, to the admiration of the learned world. His *Commentaire sur le Yagna* (1833), a masterpiece of lucidity and erudition, first revealed the language and doctrine of Zoroaster to the western world. He next made an attempt to decipher the cuneiform inscriptions of Persepolis, in his *Mémoire sur deux Inscriptions Cuneiformes* (1836). Here, however, the later discoveries of Lassen, Holtzmann, Oppert, and others, have shown that his Zend studies hindered him to some extent in deciphering, for relying on Zend analogies he assumed too many signs for vowels, and did not leave enough for consonants. In 1840 he published the text, along with a translation, of the *Bhāgavata Purāna*, a system of Indian mythology and tradition. As the fruit of six years' study of the Sanskrit books of the Buddhists, sent by Hodgson to Europe from Nepal, appeared in 1844 his *Introduction à l'Histoire du Bouddhisme*, an epoch-making work in the history of that great Asian religion. His last work was a translation of *Le Lotus de bonne Loi*, which was passing through the press at the time of his death. Among Burnouf's pupils were Max Müller, Goldstücker, Gorresio, and Nève.—ÉMILE LOUIS, nephew of Jean Louis, born at Valognes, 25th August 1821, lectured on ancient literature at Nancy, was for a time director of the French school at Athens, and wrote on Sanskrit, the Vedas, the science of religion, Japan, and Athens.

Burns, JABEZ (1805–76), Baptist minister, was born at Oldham, and in 1828 and 1829 published *The Christian Sketch-book* and *The Spiritual Cabinet*, the first two of a long series of works (over thirty in number). He was minister at Perth in 1830–35, and thenceforward till his death in Marylebone, London. Both in Britain and the United States he lectured on temperance, peace, and the abolition of capital punishment. One of his later works, *Sketches and Skeletons of Sermons* (15 vols.), reached a 14th edition; another was the *Pulpit Cyclopaedia* (4 vols. 1846–60).

Burns, JOHN, born in Vauxhall in 1858, worked as a boy in a candle-factory there and in engine-works, and was foreman engineer in West Africa for a year. He became a leader in the Labour movement and an active member of the Social Democratic Federation, and came into prominence in connection with strikes. He was imprisoned for six weeks in 1887 for resisting the police in asserting the right of public meeting in Trafalgar Square. In 1889, when working in a printing-machine establishment, he was elected to the London County Council, and in the same year sat on the committee by which the great London dock strike was settled. In 1892 he was first elected member of parliament for Battersea, for which he continued to sit till 1918. In Sir Henry Campbell-Bannerman's and Mr Asquith's cabinets he was President of the Local Government Board (1905-14) and of the Board of Trade (1914), but lost popularity with extreme Radicals. He resigned on the outbreak of war in August 1914.

Burns, ROBERT, the national poet of Scotland, and in all literature one of the most singular geniuses, was born at Alloway, in the neighbourhood of Ayr, January 25, 1759. The history of most of his life is so well known, and what is not well known requires so much conjecture and research to elucidate it, while so much space were needed for the elucidation, that a meagre sketch must here suffice. About Burns, as about Shelley, our knowledge is almost too abundant. We might prefer that poets should live only in the light of their works, and that their personal existences were as obscure as those of Shakespeare and of Homer. But, in the case of Burns, this penumbra is impossible. Even if we had not his letters and the records left by people who met him, his poems would tell all the tale. In his poems his story lives unconcealed and imperishable; his loves and hates, his vices, his mirth, his shame, his mockery, his bitterness, his repentance; there is not a mood but has its verse. There is no possibility here of keeping the poetry and blinking the poet.

Burns's family was of the humbler and less prosperous yeomanry. His father built the 'clay bigging' where he was born. When the boy was seven, the father, an intelligent man with a great belief in education, moved to Mount Oliphant, four miles south-east of Ayr. When the boy was thirteen, there was another move to Lochlea. But the elder Burns did not prosper, and died when the poet was twenty-five. His education began at a school at Alloway Mill, and was continued by Mr John Murdoch, as a kind of private tutor. This education was thoroughly literary; the boy was exercised in turning verse into prose, selecting synonyms, and so forth. A metrical *Life of William Wallace* was a favourite book; and his letters to Clarinda, and many other correspondents, owe something to a selection of correspondence of Queen Anne's reign. There is to be noticed in Burns not merely a natural fire and gift of expression, but a steady conscientious culture of the gift. He had scarce any Latin, and no Greek, but it is not easy to see how his poetical style could have been improved by a knowledge of these languages. With French he was acquainted, and however much one may believe in the educational influence of Greek, it is perfectly plain that true literary genius can dispense with it. Unlike Hogg, Burns had always more or less consciously studied the *technique* of his art. He only fails when he imitates the artificial English manners of his age. Among the early influences which give the ply to his genius, ought, no doubt, to be reckoned the popular tales and ballads and songs of Betty Davidson, an old woman

who lived with the poet's family. One of the first books that Sir Walter Scott ever possessed was a set of ballads, collected by himself when a boy, bound in three volumes, and often rescued with difficulty from the servants. Burns grew up with the same old lays in his ears, not read on fly-sheets, but recited. Popular Scotch poetry and traditions are thus the soil, as it were, in which the genius of our two Scottish poets grew. But Scott saw life in the magic of romance. Burns beheld it in the light of every day.

Even in boyhood the education and native genius of Burns soon made him friends among people born to a better place at the table of life than his own. He went to a dancing-school, and began to make a great deal of love for himself and for less confident swains. He read Allan Ramsay, and began to write a little. Acquaintance with sailors and smugglers very considerably widened his moral ideas. He became a kind of rural Don Juan, though he had too much heart for the rôle. It is useless to deny that the tone of Scotch rustic morality about the relations of the sexes is, and was, very like the morality of Sicilian swains in the time of Theocritus. If Burns had to appear among the penitents, there were seven other sinners with him. The institution of wooing a bonny lassie 'when the kye comes hame,' the *Oaristys*, as Theocritus and Homer call it, has never been peculiar to Sicily. Burns was a man of more attractions, and stronger passions than his neighbours, and when that has been said, there is really no more to say. A worse man, or a man with a worse heart, would easily have escaped from the entanglement with Jean Armour. A luckier man might have married Highland Mary, and been happy with his one true love, but such luck is given to few.

The death of Burns's father in 1784 left him to try to farm for himself. Farming without capital was, even then, like gambling without capital. One reverse meant ruin. Burns's husbandry went ill, he met Jean Armour, the entanglement began (he was then twenty-five), and out of his poverty, his passion, his despair, and his desperate mirth, came the extraordinary poetic harvest of 1785. To this year belong the *Epistle to Davie*, *Death and Dr Hornbook* (where the poet is very frank about his convivialities), *The Twa Herds*, *The Jolly Beggars*, *Hallow E'en*, *The Cottar's Saturday Night*, *Holy Willie's Prayer*, *The Holy Fair*, and *The Address to a Mouse*. If we had only the verses of this year, Burns would remain the greatest of known popular poets. His topics were topics at which, probably, dozens of other rural rhymers were hammering—the quarrels, lay and clerical, of the neighbourhood; banter of local notorieties; and sketches of rural manners. But then Burns touched them with the hand of an artist; he was a master already in this craft, and no poet, perhaps, of any language has ever attained such a wild perfection as he reaches in the reckless merriment of *The Jolly Beggars*:

Life is all a variorum,
We regard not how it goes;
Let them cant about decorum
Who have characters to lose.

That is the essence of *Les Gueux*; M. Richepin gives us a volume of the poetry of beggarhood, but a little is enough. The next year found Burns still busy; it was another *annus mirabilis*, though much of the verse is satirical, and necessarily less interesting. *The Twa Dogs* is a masterpiece of humour; *The Lament* and *Despondency* remind one of Regnier, who sinned in earnest and repented in verse. In this year there was abundant trouble with Jean Armour; there was the betrothal to Highland Mary, and her death. Looking about him for money, that he might

emigrate to Jamaica, Burns published the famous and much-sought-after Kilmarnock edition of his poems (600 copies, 1786). Their fame spread, Burns got a few pounds, and was just setting sail, when the praises and promises of admirers induced him to stay in Scotland. In winter he went to Edinburgh, met the wits and the great, was a lion, and tasted all the sweets of that estate, with much more than a necessary proportion of the bitter. He was as proud as he was poor, and no doubt fancied many slights and affronts that were in the mind of no one else. Here, too, Scott saw him, Scott being then a boy, and remembered the fire and beauty of his dark brown eyes. The poems were reprinted in 1787, and some money came in (about £500 ultimately). Burns erected a tomb over Fergusson, his ill-fated predecessor and master. On returning to the country, he was much made of, and, like Sir Lancelot in the romance, 'fell to his old love again,' Jean Armour. After a Highland tour with a blackguard dominie called Nicol, Burns went back to Edinburgh, and began the epistolary flirtations with Mrs M'Lehose (Clarinda). Neither the friendship with Nicol nor the affair with Clarinda was very creditable to Burns's taste. In the 'Letters to Clarinda,' as Mr R. L. Stevenson remarks, 'the design may be that of an Old Hawk, but the style is more suggestive of a Bird of Paradise;' indeed, Burns elsewhere speaks of himself as 'an old hawk at the sport' of bringing his bird to his feet. Like Keats's love-letters, the letters to Clarinda should have been burned at once. But men will write, and women will print, while the world stands. By this date Mr Johnson had set about publishing his *Scots Musical Museum*, to which we owe all that is briefest and brightest of Burns. He contributed an astonishing number of the most beautiful, tender, passionate, and vivacious songs in any language, chiefly adapted to old Scotch airs, and moulded now and then on old Scotch words. An edition of Scotch songs, with the old words and the words of Burns, would be a valuable book, though not precisely a book for drawing-rooms. Many of the ancient ditties were of a singular license, though that does not make them less useful to the student of popular manners and of literary history. But very often, as in the deplorable case of Allan Ramsay's verses, the new songs have devoured and destroyed the old. Indeed, as Hogg's mother told Scott, printing popular songs generally kills their natural life, much more than the printing of substituted words.

In 1788 Burns was writing to Mrs M'Lehose of Jean Armour as 'the expiring glimmer of a farthing taper beside the glory of the meridian sun.' Such are the loves of the poets: here is their gratitude — 'in less than two months they were married,' Burns proving better than his word. 'I am the fool,' he wrote once, 'of my feelings and attachments.' He took a lease of Ellisland farm, on the Nith, near Dumfries, and next year received an appointment in the Excise. The following year again (1790) saw the birth of *Tam o' Shanter*, written in one day. By 1790 Ellisland, like all Burns's worldly enterprises, proved a failure. In November 1791 came his farewell to Clarinda (Mrs M'Lehose) — 'Had we never loved so kindly,' and other nymphs had been loving rather blindly in the meantime. Burns left his farm, withdrew to Dumfries and to gauging, flirted with the French Revolution, drank, wrote songs, expressed opinions then thought Radical, and made himself unpopular with the local lairds. If he wrote lampoons on ladies at this date (1794), Horace, Martial, and Lander at different times behaved no better. In 1795 he became, one may be glad to note, a patriot again, and wrote songs against the French. He

died—the deplorable causes of his death need not be lingered over—on July 21, 1796.

His country has been much scorned for her treatment of Burns. How was she to treat him? He deserved, what Socrates said *he* merited, 'to be kept at the public expense in the town-hall.' But he would not have accepted the offer had Scotland possessed a Prytaneum, and had Scotland made the offer. He did not try to live (as others in his position, and not without a share of his genius, have lived) by literature. He came too early. Such a poet now might actually exist on the proceeds of his poetry. What can the world do for such geniuses as Burns and Byron? They do not 'plough a straight furrow,' as the Greek proverb ran; their passions are part of their glory, their sorrow, and their shame. Their reward is immortality.

Burns is so much the greatest of Scotch poets that no other comes into the reckoning. Scott is a genius more universal, more genial, and a character infinitely more amiable and delightful. But for the mere essence of poetry and spirit of song, there is not the equal of Burns, not only in Scotch verse, but in the literature of the world. Sappho and Catullus are his peers; perhaps, indeed, no other lyric poet can be named with Sappho. The Tenth Muse does not compete with mortals, as the Nine sang against Thamyris the Thracian. She has a legendary magic, and dwells alone. But Catullus, with much of the fire, affection, and humour of Burns, has nothing like his range. Burns is not only a lyric poet of unsurpassed energy, and of an art usually unerring, but he is a satirist, and a descriptive poet second to few. He takes our hearts by storm; he rushes in with the fifes and pipes playing gloriously; he wins us at once by a natural intrepid gallantry of art. It is for this gay courage, or again for his brief natural sadness, that he is so esteemed, and for an art neither fairy-like, like Keats; nor magical, like Virgil's; nor full of winning grace, like that of Horace; but simple, unaffected, completely appropriate, and classically clear. For loyal despair what can equal

Now a' is done that men can do,
And a' is done in vain;

for loyal gallantry,

Oh, Kenmure's on and awa, Willie!

for fresh beauty of nature,

When o'er the hill the eastern star;

for proud content,

I hae a wife o' my ain!

for jollity (the rhyme Scott parodied in his last year),

Blythe, blythe, and merry was she;

for pathos,

John Anderson, my jo, John!

and so on. Who can number all these watchwords of the Scotch people, to which a ready response is made by how many myriads of hearts all the world round! If he carried the famed theory of Aucassin rather far when he wrote

The kirk and state may gae to hell,
And I'll gae to my Anna,

his example was not so attractive as to tempt many readers after him. It is not the faults of Burns, on the whole, nor his shamefaced glorying in them that remain in the memory and the imagination. We cannot believe that he has really encouraged the faults of his countrymen, as some say. There is no encouragement in that shamefaced glorying of 'The Daddy o't,' nor in his pitiful repentances. It is the good element in him, the tender heart, and proud courage and sound humour that survive,

that inspire his verse, and communicate themselves to his hearers. On the rest the righteousness of Oblivion scatters his poppy, and leaves us only the memory of a great poet.

Bibliography.—Poems (Kilmarnock, 1786; Edinburgh, 1787; London, 1787; Edinburgh and London, 1793).—Editions, with Life, by Currie (4 vols. London, 1800); Allan Cunningham (8 vols. London, 1834); Chambers (with the poems and letters interspersed throughout the life, 4 vols. Edin. 1851; new ed. by W. Wallace, 1896); W. Scott Douglas (7 vols., with Life, &c., by Prof. Nichol, Edin. 1877-82; reissued 1896); Henley and Henderson (4 vols. 1896-97); and the present writer (1 vol. 1896). There were many minor editions in the centenary year from Burns's death, 1896, when enthusiastic commemorations were carried out, monuments erected, and a Burns exhibition held at Glasgow. See also the Life by Lockhart; by Shairp, in 'Men of Letters'; by Alexander Smith, in the 'Globe' series; the Essays by Carlyle, and by R. L. Stevenson (*Men and Books*); the French Life and Works by Angellier (Paris, 1893); the German study by Hans Hecht (Heidelberg, 1921). There are German translations by Freiligrath, Ruete, Bartsch, and others, besides Flemish and other versions.

Burns and Scalds are injuries to the body caused by excessive heat or by chemical agents. These accidents are extremely common; moreover, they are in their severer forms far the most painful of injuries, and the most commonly fatal in civil life. Dupuytren's classification in six degrees, according to the depth of the injury, is now generally accepted: (1) skin reddened; (2) skin blistered—i.e. cuticle destroyed; (3) true skin partly destroyed; (4) skin wholly destroyed; (5) soft parts below skin (muscles, tendons, &c.) more or less destroyed; (6) all parts, including bone, destroyed. In almost every burn beyond the first degree, two or more of the degrees are combined in different parts of the affected surface. The last two are rarely met with. But the danger to life from these injuries depends even more on their extent than on their depth; if a very large surface of skin be involved, even in the first or second degree, the case is a serious one; and the more so the younger the sufferer. Persons 'burned to death' in a conflagration, however, perish much oftener by suffocation, resulting from the noxious gases evolved, than from the effects of a burn properly so called.

In a severe burn or scald the pain is intense, and the Shock (q.v.) and prostration extreme and often fatal. At this stage opiates, warmth, and stimulating remedies are necessary. In two days or less, if the patient survive the shock of the injury, reaction sets in, and serious internal inflammations frequently occur. The organs situated beneath the injured surface are often affected, if this be on the trunk; but whatever part of the skin has suffered there is a tendency to inflammation and ulceration of the mucous membrane of the digestive tract, particularly the duodenum. These inflammations are not readily amenable to treatment, which must in the great majority of cases be directed chiefly to the support of the patient's strength and the alleviation of his sufferings. They occur for the most part within two weeks of the injury; after this period, however, there is the further risk that he may sink from exhaustion in consequence of the prolonged suppuration which follows the separation of the dead portions of tissue in burns deeper than the first degree.

For the local treatment of burns, innumerable measures have been recommended. Here only a few of the simpler applications, suitable to the slight degrees and early stages, can be described. The clothes must be removed with the greatest care, cut and not dragged off the injured part, lest the cuticle be adherent and be torn off with them, exposing the tender skin beneath. If the burn be

of the first degree and not extensive, moist or oily applications are generally most useful and pleasant to the patient; lint dipped in a weak, warm solution of bicarbonate of soda, or in Goulard water (dilute solution of subacetate of lead), and frequently moistened, does well. If the injured surface be extensive, cold applications are apt to increase the shock and the tendency to internal inflammations; and starch and boric acid, or similar mildly antiseptic dusting powder, should be thickly dusted over the surface and covered with cotton-wool. If the burn be of the second degree, the blisters should be snipped with scissors and the contained fluid let out; but the raised skin must be carefully preserved as a protection to the tender surface below. Carron oil, consisting of a mixture of linseed oil and lime-water in equal parts (with 10 per cent. of eucalyptus oil added as a preservative), may be applied on lint. Any unirritating vegetable oil, such as olive oil, may be substituted if linseed oil be not procurable. It takes its name from the Carron ironworks, where it has long been used, and is an excellent application. In the case of severer burns, painting the surface with tincture of iodine, or applying lint soaked in solution of picric acid, hardens, dries, and soothes the skin. Recently spraying the surface with melted paraffin by means of a special apparatus has been highly recommended. It is most important that the dressings be not changed oftener than absolutely necessary, whatever application is adopted; they should be left till the discharge loosens them, or till they become uncomfortable, or offensive on account of putrefaction of the dead tissues and discharges.

The local effects of burns, particularly those of the fourth degree, are of great importance; for during and after the healing of the resulting sores there is an excessive tendency to contraction of the cicatrix, and very serious deformity often results, especially when the injury is on the neck or near the joints of the limbs. Severe injuries of this kind should therefore be under skilled observation not only during the healing process, but for some time after its completion, in order that, if any such tendency appears, measures may at once be taken to counteract it.

When the clothes catch fire, the person should lie down on the floor, and roll, or be rolled, in a rug, table-cover, or anything sufficiently voluminous to stifle the flames; and afterwards the clothes, especially stockings, should be removed with great care, lest the cuticle should separate with them, which would materially increase the sufferings of the patient.

Extensive scalds or burns are very fatal to young children; and it must be remembered that their skin is more susceptible to external impressions, and will suffer from a degree of heat innocuous to an adult. Infants have frequently been scalded to death in too hot baths, or by too hot fomentations. The principles of treatment for burns produced by the contact of chemical agents to the skin, are the same as those for burns by fire.

Burnside. AMBROSE EVERETT, American general, born at Liberty, Indiana, 23d May 1824, served an apprenticeship to a tailor, but received a nomination to West Point, where he graduated in 1847. He left the army as first-lieutenant in 1852, but returned as colonel of volunteers in 1861, commanded a brigade at Bull Run, and in February 1862 captured Roanoke Island. Having rendered important services at South Mountain and Antietam, he in November reluctantly superseded M'Clellan. On December 13, he crossed the Rappahannock, and attacked Lee near Fredericksburg, but was repulsed with a loss of over 10,000 men, and was soon after transferred to the department of Ohio. In November 1863 he successfully held Knoxville

against a superior force, and in 1864 he led a corps under Grant through the battles of the Wilderness and Cold Harbour. Resigning in April 1865, he was elected governor of Rhode Island (1866-68), and United States senator in 1875 and 1881. He died 3d September 1881.

Burntisland, a seaport of Fife, on the Firth of Forth, 5 miles N. of Granton by steam-ferry (1848), of great importance till the opening of the Forth Bridge in 1890. Backed by the Bin, 632 feet high, it has a quaint parish church (1594), and the old castle of Rosend, where Chastelard (q.v.) incurred his doom. The harbour has been much improved; coal is shipped in large quantities; and ships are built. In summer Burntisland is resorted to as a watering-place. It is one of the five Kirkcaldy burghs. Pop. 5700.

Burnt Offering. See SACRIFICE.

Burnt Sienna, a fine orange-red pigment, obtained by burning the ferruginous ochreous earth known as Terra di Siena. See SIENA. For BURNT UMBER, see UMBER.

Burnt Stones, antique carnelians found in ruins, and seeming to have been acted upon by fire, having a dull appearance externally, but exhibiting a beautiful red colour when held up to the light.

Burr, AARON, an American statesman, born at Newark, New Jersey, 6th February 1756, graduated at Princeton, where his father and grandfather (Jonathan Edwards) had been president of the college, and in 1775 joined the patriot army, in which he gained a high reputation, and in 1777 the rank of lieutenant-colonel. Retiring in 1779, he was in 1782 called to the bar, where he soon became a leader. He was attorney-general in 1788-90, United States senator in 1791-96, and vice-president of the United States in 1800-4. His defeat in a contest for the governorship of New York led him to force a duel (11th July 1804) on the most active of his opponents, Alexander Hamilton, who had been his personal rival for many years, and who now fell mortally wounded at the first fire. Burr fled to South Carolina, and though indicted for murder, returned after the excitement had subsided, and completed his term as vice-president. He now prepared to raise a force to conquer Texas, and establish there a republic, which might detach the western states from the Union. This enterprise was proclaimed by the president, and Burr tried for treason (1807). Acquitted, but bankrupt in reputation, he spent some wretched years in Europe, and in 1812 returned to his law practice in New York. Here, shunned by society, the unhappy man, who had long survived all the members of his own family, died on Staten Island, 14th September 1836, in the home of an old friend. Of polished manners and fascinating address, he came to be universally regarded as self-seeking and untrustworthy. See his *Journal* (1903), and *Life* by Merwin (1899).

Burra Burra, a famous copper-mine in South Australia, 101 miles from Adelaide, whence between its discovery in 1844 and the time when it ceased working about 1880 ore to the value of near £5,000,000 was raised. Since 1905 attempts have more than once been made to work it again.

Burrard Inlet, a narrow inlet at the south-west corner of British Columbia, a little north of the mouth of the Fraser River. Nine miles long, it forms one of the finest harbours on the Pacific coast, deep, safe, and easy of access for the largest ships. It has become of much more importance to the world since the opening of the Canadian Pacific Railway, whose terminus is at Vancouver on the north shore of this inlet. It is rich in fish.

Bur-reed (*Spartanium*), a genus of Typhaceae

closely allied to the Bulrush (q.v.), and of similar habitat and distribution, but readily distinguished by its globose flower-heads.

Burrell, or BHARAL, the 'blue sheep' (*Ovis nahuha*) of the Himalayas, connects the typical wild Sheep (q.v.) with the goats.

Burriana, in Spain, 34 miles N. of Valencia, is on an estuary a mile from the Mediterranean, with a harbour on the open sea; pop. 15,000.

Burrinjack, a great Australian irrigation area on the river Murrumbidgee (q.v.).

Burritt, ELIHU, 'the learned blacksmith,' was born at New Britain in Connecticut, 8th December 1810, and bred a blacksmith, but devoted his leisure to study, especially to mathematics and languages, learning Latin, Greek, Hebrew, Arabic, and other oriental tongues, and almost all modern European languages. He was, however, much better known to the world as an earnest apostle of peace than as a scholar. At Worcester he edited the *Christian Citizen*, advocating the peaceful settlement of international difficulties and the doctrine of 'universal brotherhood,' for which purpose he also travelled through Europe and the United States. His chief works are *Sparks from the Anvil* (1848), *Olive Leaves* (1853), *Peace Papers* (1869), *Lectures and Speeches*, and *A Walk from John o' Groat's to Land's End* (1865). He took a prominent part in several Peace Congresses, and in advocating an ocean penny-postage. For many years he resided in England, from 1865 to 1870 as United States consul at Birmingham. He died at New Britain, 6th March 1879. See the memorial volume containing his Life, by Charles Northend (1879).

Burroughs, JOHN (1837-1921), a popular author on both sides of the Atlantic, born in Roxbury, New York. He was brought up on a farm, and after some years of teaching, journalism, and clerking in the treasury department at Washington, he settled down in 1874 on a farm in New York, to divide his time between literature, fruit-culture, and periodic duties as a bank-examiner. His books mostly deal with country life, and show great sympathetic insight into the life of nature. He is a born naturalist, and, whether he discourses of flowers, birds, fishes, or even insects, displays a loving interest suggestive of his nearest English analogue, White of Selborne. His chief works are *Walke Robin* (1871), *Winter Sunshine* (1875), *Birds and Poets* (1877), *Locusts and Wild Honey* (1879), *Pepacton* (1881), *Fresh Fields* (1884), *Signs and Seasons* (1886), *Sharp Eyes* (1888), *Indoor Studies* (1889), *Riverby* (1894), *A Study* (1897), *The Light of Day* (1900), *Squirrels and other Fur-bearers* (1900), and *Bird and Bough Poems* (1906).

Burrows, MONTAGU (1819-1905), naval commander and professor of history, was born at Nadley near Barnet. He took part in engagements against the Malay pirates (1836) and at the capture of St Jean d'Acre (1840), and became commander in 1852. Then going up to Oxford, he took a double first, and became Chichele professor of modern history (1862-1900) and fellow of All Souls (1870). His works include *Pass and Class* (3rd ed. 1866), *Constitutional Progress* (2nd ed. 1872), *Worthies of All Souls* (1874), *Parliament and the Church of England* (1875), *Wiclif's Place in History* (1882), *Life of Hawke* (1883), *The Cinque Ports* (1888), *Commentaries on the History of England* (1893), *History of the Foreign Policy of Great Britain* (1895), and *Autobiography* (1908).

Bursary, the annual proceeds of a sum permanently invested for the maintenance of a student at a Scottish university. Small bursaries were long the only equivalents for the English scholarships; but the University Commissioners of 1862

consolidated many, and removed some antiquated restrictions. In some cases a preference for a particular name or birthplace remains.

Burscheid, a town of Prussia, on the Wupper, 20 miles SE. of Düsseldorf, with woollen and plush manufactures; pop. 10,000. See BURTSCHIED.

Burschenschaft is the name of a famous association of German students, at one time prominent in the politics of the Fatherland. The name is derived from *Bursch*, a word ordinarily meaning 'student' or 'young fellow,' but more properly a student as member of an association. *Bursch* is itself from the Lat. *bursa*, 'purse,' the common fund of a company of students living at a common table in the universities of the middle ages. The *Burschenschaft* was a club of students who had fought in the great war of liberation, and was founded at Jena in 1813; its aim, in contrast to the mainly convivial character of other student clubs, to cherish the ideal of German national unity. Soon the *Burschenschaft* comprised students of fourteen universities; but it was inevitable that in the time of reactionary policy the club should be suspected of revolutionary tendencies, and in 1819 the *Burschenschaft* was dissolved by the Prussian and other governments. The result was the formation of numerous secret and really revolutionary associations, with prosecutions and imprisonments. Not till 1848 were student clubs freed from severe restrictions.

Burseraceæ, an order of archichlamydeous dicotyledons akin to *Meliaceæ*. There are some 300 species, tropical trees and shrubs, with dotted leaves. Many yield resins and balsams. See BALSAMODENDRON, BALSAM OF GILEAD, BDEL-LIUM, BOSWELLIA, ELEMI, MYRRH.

Burslem, a town of Staffordshire, in 1910 incorporated with the county borough of Stoke-on-Trent (see STOKE-UPON-TRENT), and known as the 'mother of the potteries,' the pottery manufacture having been here established about 1644. Porcelain and pottery of all kinds are produced on a large scale. Burslem, a municipal borough since 1878, was the birthplace of Josiah Wedgwood; and a Wedgwood Memorial Institute (1870) serves as a school of art, free library, and museum. Pop. (1851) 16,954; (1901) 38,766.

Burt, THOMAS (1837-1922), Liberal and Labour member of parliament, was born at Murton Row, Tynemouth, and worked in coal-mines from the age of ten. In 1865 he was elected secretary of the Northumberland Miners' Mutual Provident Association. He was a British representative at the Berlin Labour Conference (1890), president of the Trades Union Congress, Newcastle (1891), sat for Morpeth (1874-1918), was secretary to the Board of Trade 1892-95, and became a Privy-councillor in 1906. See *Life* by Aaron Watson (1908).

Burton, SIR FREDERIC WILLIAM, water-colour painter, was born in County Clare in 1816, and educated at Dublin. In 1856 he became a member of the Society of Painters in Water-colours, and in 1884 a knight. From 1874 till 1894 director of the National Gallery, he died 16th March 1900.

Burton, JOHN HILL, historian, was born at Aberdeen on the 22d of August 1809. Having graduated at Marischal College, Aberdeen, he was articled to a lawyer, but soon came to the Edinburgh bar, where, however, he mainly devoted himself to study and letters. He was in 1854 appointed Secretary to the Prison Board of Scotland, and became one of the Prison Commissioners for Scotland. He held the old office of Historiographer Royal for Scotland, was LL.D. of Edinburgh University, and D.C.L. of Oxford. He died near Edinburgh, 10th August 1881. For a long series of years, from 1833 downwards, he was a

contributor to the *Westminster Review* of articles on law, history, and political economy; to *Blackwood's Magazine*, the *Scotsman*, &c., he furnished many literary sketches; and he was a contributor to the first edition of this *Encyclopædia*. Among his original works may be mentioned *Life of Hume* (1846), *Lives of Simon Lord Lovat and Duncan Forbes of Culloden* (1847), *Political and Social Economy* (1849), *Narratives from Criminal Trials in Scotland*, *A Manual of Scottish Law*, *A Treatise on the Law (Scottish) of Bankruptcy*, *History of Scotland from the Revolution to the Extinction of the Last Jacobite Insurrection* (1853), *The History of Scotland from Agricola's Invasion to the Revolution of 1688* (7 vols. 1867-70; new edition, enlarged and partly rewritten, 8 vols. 1873), *The Book-Hunter* (1862), *The Scot Abroad* (2 vols. 1864), *The Cairngorm Mountains* (1864). He edited vols. i. and ii. of the *Register of Privy Council* (Scotland) for 1545-78; and issued *A History of the Reign of Queen Anne* in 1880. He further edited the works of Bentham (in conjunction with Sir John Bowring), with an able introduction; and published a volume of *Benthamiana*. See *The Book-Hunter*, new edition (1882), with Memoir by his wife.

Burton, SIR RICHARD FRANCIS, one of the most daring and successful of modern travellers, was born in 1821 at Torquay, the son of Colonel Joseph Natterville Burton, and was educated in France and England. In 1842 he entered the Indian service, and served in Sind under Sir Charles Napier. In 1851 he published his first important work on *Sindh*. Burton acquired a very familiar acquaintance with Hindustani and Persian, and learned to speak Arabic like a native. He resolved to explore Arabia in the disguise of an Afghan pilgrim; and after a visit to England, in 1851 he set out on his journey. His *Personal Narrative of a Pilgrimage to El Medinah and Mecca* (1855; new ed. 1879-80) records one of the most daring feats on record. His next journey was into the country of the Somalis, in Eastern Africa. He was chief of the staff to General Beatson in the Crimea. In 1856 he set out in company with Speke (q.v.) on the journey which led to the discovery and exploration of the great lake of Tanganyika (q.v.), and afterwards travelled in North America. In 1861 he married, and was appointed consul at Fernando Po; and while holding this appointment, he visited the Cameroon Mountains, and went on a mission to the king of Dahomey. He was subsequently consul at Santos in Brazil, and at Damascus; and in 1872 he succeeded Charles Lever in the post of British consul at Trieste. In 1876-78 he paid two visits to Midian. In 1882 he visited the gold-producing country of the Guinea coast, along with Captain Cameron. He received the gold medal of both the English and French geographical societies. He was master of thirty-five languages and dialects. He received the honour of knighthood in 1886. Lady Burton, who was of a Catholic family, was the companion of his wanderings from 1861, and wrote a narrative of travel, *Arabia, Egypt, India* (1879), and *Inner Life of Syria, Palestine, &c.* (1875).

Among Burton's many works are: *First Footsteps in East Africa* (1856), *The Lake Regions of Central Africa* (1860), *The City of the Saints* (1861), *Wanderings in West Africa* (1863), *The Nile Basin, Vikram and the Vampire* (1869). He also wrote two other books on Sind, and works on Goa, Abbeokuta, Paraguay, Brazil, Syria, Zanzibar, Iceland (*Ultima Thule*, 1875), Bologna, and Midian; on falconry, sword exercise, and bayonet exercise; gave us a translation of *Os Lusíadas* of Camoens (1880), his lyrics, and a *Life and Commentary* (1881); and a history of *The Sword* (1883).

In 1885-88 he published a new and literal translation of the *Arabian Nights* (q.v.) (10 vols. and 6 vols. of supplement), of which his wife issued an expurgated edition. He died 20th October 1890.

There are Lives by Hitchman (1887), Lady Burton (1887), Miss Stisted (to confute Lady Burton's view, 1896), and by T. Wright (1906).

BURTON, ROBERT, author of the *Anatomy of Melancholy*, was born at Lindley in Leicestershire, in 1577, and educated at Nuneaton and Sutton Coldfield. He entered Brasenose College, Oxford, in 1593, and in 1599 was elected scholar of Christ Church. In 1614 he took his B.D., and two years later was presented by the dean and chapter of Christ Church to the vicarage of St Thomas at Oxford, and about 1630 by Lord Berkeley to the rectory of Segrave in his native county. Both livings he kept 'with much ado to his dying day,' and appears to have continued all his life at Christ Church, where he died 25th January 1639, leaving behind him a fine collection of books, many of which were bequeathed to the Bodleian. He was buried in the north aisle of Christ Church Cathedral, where a monument was erected to his memory, on which his bust was placed, with the calculation of his nativity inscribed above it, and beneath the epitaph he had composed for himself: *Paucis notus, paucioribus ignotus, hic jacet Democritus Junior, cui vitam dedit et mortem Melancholia*. His death took place at or very near the time he had foretold some years before by the calculation of his own nativity. This gave rise, Wood tells us, to a report that he had 'sent up his soul to heaven thro' a slip about his neck.' Burton is thus described by Anthony à Wood: 'He was an exact mathematician, a curious calculator of nativities, a general read scholar, a thro' paced philologist, and one that understood the surveying of lands well. As he was by many accounted a severe student, a devourer of authors, a melancholy and humorous person; so by others, who knew him well, a person of great honesty, plain dealing, and charity. I have heard some of the antients of Christ Church often say that his company was very merry, facete and juvenile, and no man in his time did surpass him for his ready and dextrous interlarding his common discourses among them with verses from the poets or sentences from classical authors, which being then all the fashion in the university, made his company more acceptable.' Little is known of his life, but there is one story in Bishop Kennet's *Register and Chronicle* (1728) that must not be omitted, from the light it throws on a passage about Democritus in Burton's preface: 'In an interval of Vapours he would be extremely pleasant, and raise Laughter in any Company. Yet I have heard that nothing at last could make him laugh, but going down to the Bridge-foot in Oxford, and hearing the Barge-men scold and storm and swear at one another, at which he would set his Hands to his Sides, and laugh most profusely.'

The first edition of the *Anatomy of Melancholy* was in quarto form, and appeared in 1621. Four more editions in folio were published within the author's lifetime, each with successive alterations and additions, spite of the author's announcement in the preface to the third (1628) that he would make no more changes. In this edition also first appeared the famous emblematic frontispiece. The final form of the book was the sixth edition (1651-52), printed from an annotated copy given just before Burton's death to the publisher, Henry Cripps, who gained, Wood tells us, great profit out of the book. This great work is divided into three divisions, each subdivided into *sections, members, and subsections*, and each preceded by an elaborate synopsis of its contents. Part I. treats of the causes and symptoms of melancholy, Part II. of

the cure of melancholy, and Part III. of love melancholy and religious melancholy. One of the most interesting parts of the book is the long preface, 'Democritus to the Reader,' in which Burton gives indirectly an account of himself and his studies, and apologises for not having bestowed his time on the composition of books of divinity, for which he saw 'no such great need,' there being 'so many books in that kind, so many commentators, treatises, pamphlets, expositions, sermons, that whole teemes of oxen cannot draw them.' Burton has had no better critic than himself in this same preface. He says: 'I have laboriously collected this Cento out of divers Writers, and that *sine injuria*, I have wronged no authors, but given every man his own.' And further, of his style he says: 'I neglect phrases, and labor wholly to inform my reader's understanding, and not to please his ear; 'tis not my study or intent to compose neatly, which an Orator requires, but to express myself readily and plainly as it happens. So that as a River runs sometimes precipitate and swift, then dul and slow; now direct, then *per ambages*; now deep, then shallow; now muddy, then clear; now broad, then narrow; doth my stile flow: now serious, then light; now comical, then satyirical; now more elaborate, then remisse, as the present subject required, or as at that time I was affected.' In the same preface he tells us 'I writ of melancholy, by being busie to avoid melancholy . . . to comfort one sorrow with another, idleness with idleness, *ut ex vipera theriacum*, make an Antidote out of that which was the prime cause of my disease.'

This strange book is unique in its interest, and is far more systematic in its construction than the superficial or merely occasional reader is apt to imagine. It is indeed a farrago from all, even the most out-of-the-way classical and medieval writers, yet not one quotation out of all his ponderous learning but lends strength or illustration to his argument. Every page is marked by keen irony, profound and often gloomy humour, and by strong and excellent sense; while throughout the book there runs a deep undertone of earnestness that fits well with its concluding sentences, and at times rises into a grave eloquence of quite singular charm. The 'fantastic old great man' is as certain of immortality as the greatest masters in English literature, and his readers will ever love him with no common love. Boswell tells us that Dr Johnson said Burton's *Anatomy of Melancholy* was the only book that ever took him out of bed two hours sooner than he wished to rise; and Charles Lamb shows the influence of the book not less in many a turn of his own quaint style than in that marvellous direct imitation, the 'Curious Fragments extracted from a Common-Place Book which belonged to Robert Burton, the famous author of the *Anatomy of Melancholy*,' first published in 1801 in the small volume containing the tragedy of *John Woodvil*. Milton's *L'Allegro* and *Il Penseroso* owed much to 'The Author's Abstract of Melancholy' prefixed to his book, and Ferriar in 1798 pointed out to the world the indebtedness of Sterne. Byron speaks of its great value as materials 'for literary conversation,' but Wood had long before pointed out this merit: 'Tis a book so full of variety of reading, that gentlemen who have lost their time and are put to a push for invention, may furnish themselves with matter for common or scholastical discourse and writing.'

See Shilleto's edition of the *Anatomy* (3 vols. 1893); Bensley's notes and identifications in *Notes and Queries* (9th and 10th ser.); Whitley's *Literary Portraits* (1904).

BURTON-UPON-TRENT, a county borough in east Staffordshire, 25 miles from Stafford, near the junction of the Grand Trunk Canal with

the Trent, which is navigable for barges up to the town. The ancient bridge of thirty-four arches was replaced in 1864 by a new one of twenty-nine arches. Burton-on-Trent owes its rapid extension to the brewing of ale, which is the staple product of the place. The opening of the Midland Railway in 1839 paved the way for future progress. Cotton-spinning was at first the chief industry, but was discontinued in 1849. Burton's rise and progress as a brewing centre has been largely due to the suitability of the water for this purpose. There was some small local trade in beer in the 16th century; Burton ale had a reputation in London in 1630; and a considerable export trade had been established with the Baltic ports by the middle of the 18th century. Since then the trade has greatly extended, the breweries of Bass (q.v.) and Allsopp (q.v.) being on a scale of unparalleled magnitude. There are, of course, extensive cooperages, and also iron-foundries. The town was incorporated by royal charter, dated 3d September 1878. It has an endowed school, a grammar-school, a municipal school of science and art, a public library and reading-room, a museum and art gallery (1915), and a recreation-ground. A church or monastery was erected by the Trent in the 9th century; Burton Abbey was founded and endowed by Wulfrie, Earl of Mercia, in 1002. It was made over by Henry VIII. with its lands to his secretary, Sir William Paget. In a fray on the old bridge in 1321 the forces of Thomas, Earl of Lancaster, were defeated by those of Edward II. The town suffered in the civil wars of the 17th century. It has been repeatedly flooded, the water standing to a depth of 4 or 5 feet on some streets in 1875. Pop. (1861) 18,745; (1881) 39,285; (1901) 50,386; (1911) 48,266; (1921) 48,927.

Burtscheid, or BURSCHIED, a suburb of Aix-la-Chapelle, was incorporated with that town in 1897. It has manufactures of woollens, and sulphur springs and baths. See also BURSCHIED.

Buru, or BOEROE, an island of the Malay Archipelago, in the residency of Amboyna, from which it lies about 40 miles to the W. Area, with the small island of Amblau, 3360 sq. m. The marshy coast-lands are notoriously unhealthy, but lofty mountains rise in the interior, one peak (Tomahoe) attaining an altitude of 8300 feet. A dense natural forest covers most of the country, and only a very small portion has been brought under cultivation. The soil is rich, and vegetation everywhere luxuriant; but the only important article of export is Cajeput-oil (q.v.)

Bury, a flourishing manufacturing town of south-east Lancashire, between the Irwell and the Roche, 10 miles NNW. of Manchester. It is linked by canal with Bolton and Manchester. The woollen manufacture introduced by Flemings in the 14th century attained its zenith under Elizabeth, but had greatly declined by 1738, when Bury was merely 'a little market-town,' and it has long been all but eclipsed by the cotton industry. Besides spinning and weaving factories, there are important paper, print, bleach, and dye works, and some large foundries and engine manufactories. In the vicinity are excellent freestone quarries and abundant coal-mines. Among the town's institutions are a grammar-school, a technical school, an art gallery, public library and museum; there are also fine public recreation-grounds. John Kay, famous as the inventor of the fly-shuttle, was a native. Sir Robert Peel was born in a cottage near Chamber Hall. There are statues to both. Bury was made a parliamentary borough in 1832, and has since returned one member; it became a municipal borough in 1876, and a county borough in 1888. Pop. (1851) 31,262; (1921) 56,426.

Bury, JOHN BAGNELL, born in 1861, professor of modern history and of Greek in Dublin, of modern history (from 1902) in Cambridge, has written histories of Greece, of the Later Roman Empire, and of freedom of thought, and edited Pindar, Freeman, and Gibbon.

Bury, RICHARD DE. See AUNGERVILLE.

Burying Beetle (*Necrophorus*), a genus of Coleopterous (q.v.) insects, of the family Silphidae, with short club-shaped antennæ, remarkable for their habit of burying the bodies of mice, moles, and other small animals, in order to deposit their eggs



Burying Beetle.

in them, and to provide a supply of food for their larvæ. They all produce a chirping noise caused by rubbing the fifth abdominal ring against the wing-covers. When touched they give off a fluid with an extremely fetid and persistent smell. They are often covered with little red mites. Some of the species are natives of Britain, among which is *N. vespillo*, in which the habits were first observed. This form is still commoner in some parts of continental Europe. It is a black beetle, about an inch long, with two bright orange bands on its wing-covers. Its sense of smell would seem to be extremely acute, and a dead animal soon attracts it, a pair generally arriving together to feed upon the body. The male proceeds to inter the corpse if sufficiently small, previous to which, however, they have sometimes to drag it to some distance to a place suitable for their purpose. The head of the insect is the only tool employed in the operation, and is held sloping outwards, and employed in a manner which exhibits great muscular power. A furrow is first made around the body, then another within the first, and so on till the earth is so excavated from beneath, that the body begins to sink, when the insects, by great efforts, drag it down into the hole, and when it is fairly in, the excavated earth is thrown back over it. The female then lays her eggs in it; and when this is accomplished, and the cravings of appetite are satisfied, it is left for the larvæ, which are of a lengthened form, with six feet, whitish colour, and a brown head.—The known species are mostly natives of Europe and of North America. Silpha and other genera of the same family are common forms on dead and putrefying bodies.

Bury St Edmunds, or ST EDMUNDSBURY, a municipal borough and capital of West Suffolk, a clean, well-built town, pleasantly situated on the little river Lark, 26 miles NW. of Ipswich. The *Villa Faustini* perhaps of the Romans, it received its name from Edmund the Martyr, who on Christmas-day 856 was crowned here king of the East Angles, and who in 870 was shot to death at Hoxne by the Danes. His relics were translated hither in 903, and in 1020 Canute reared a Benedictine abbey in his honour, which in time became the richest and most important in England, Glastonbury only excepted. At the dissolution its annual

income was equivalent to £200,000 of our money. Of this magnificent establishment little now remains but the noble Abbey Gate (1327-40), Decorated in style, and 62 feet high; and the Norman Tower or Church Gate (*circa* 1090), a quadrangular tower of massive simplicity, 86 feet high. The cruciform church itself, which measured 512 by 212 feet, is represented only by the west front and the piers of the central tower, one of which bears the inscription: 'Near this spot, on 20th November 1214, Cardinal Langton and the Barons swore at St Edmund's altar that they would obtain from King John the ratification of Magna Charta.' Among the many religious and charitable institutions connected with the abbey, of which portions still exist, is St Saviour's Hospital, founded by that notable abbot, Samson, whose life and actions, as recorded by Jocelin (q.v.) de Brakelonde, Carlyle has so vividly recalled in his *Past and Present*. Lydgate was a 'monk of Bury'; Richard de Aungerville, Bishops Gardiner and Blomfield, and Sir Nicholas Bacon were natives. Parliaments were held here in 1272, 1296, and 1446, the last of which ordered the arrest of Humphrey, the good Duke of Gloucester, who was found dead in his bed the morning after his arrest. St Mary's and St James's churches are both fine Gothic edifices of the 15th century; in the former is the tomb of Mary Tudor, the widow of Louis XII. of France. On the erection of the see of St Edmundsbury and Ipswich in 1914, St James's became its cathedral. The grammar-school, founded in 1550 by Edward VI., was rebuilt on a new site in 1883 in Queen Anne style. Donaldson was one of its headmasters, and amongst its scholars have been Sanicroft, Cumberland, Blomfield, Fitzgerald, and Spedding. Defoe, Wollaston, and 'Mr Pickwick' were residents. Bury St Edmunds is richer in memories than, perhaps, any town of its size. The very police-office is an old Norman house, a synagogue once, and known still as Moyses's Hall; whilst the guildhall has interesting remains of antiquity. Among modern buildings are the corn exchange (1862), the Suffolk General Hospital (1826; rebuilt 1864), the barracks (1878), and the Mechanics' Institute (1853-78). Three miles SW. is Ickworth House (1792), the seat of the Marquis of Bristol. Bury was a parliamentary borough till 1918. It manufactures agricultural machinery. Pop. (1801) 7655; (1841) 12,538; (1921) 15,941. See Gillingwater's *History of St Edmundsbury* (1804); *Memoirs of St Edmund's Abbey*, edited by Thos. Arnold (Rolls series, 1890 *et seq.*).

Busachino. See BISACQUINO.

Busa'co, a ridge (1826 feet) on the north side of the river Mondego, in the Portuguese province of Beira, 16 miles NNE. of Coimbra. Here Wellington, with 40,000 British and Portuguese troops, repulsed the attack of Masséna with 65,000 French, 27th September 1810.

Busbecq, OGIER GHISELIN DE, a Flemish diplomatist, was born at Commines in 1522, and educated at Louvain, Paris, and Padua. He held various offices at the court of the emperor; but is best known as ambassador of Ferdinand (1556-62) at Constantinople. He wrote two works on Turkey. He brought many MSS., coins, and plants to western Europe, and died 1592. See his *Life and Letters* by Forster and Daniell (Lond. 1880).

Busby, a town with cotton-mills and print-works, in a mining district, 7 miles S. of Glasgow by rail.

Busby, RICHARD, a great English schoolmaster, was born at Lutton, otherwise Sutton St Nicholas, Lincolnshire, in 1606. Educated at Westminster School, and Christ Church, Oxford, he was in 1640 appointed head-master of Westminster School, the

duties of which office he continued to discharge until his death in 1695. He is the type of pedagogues alike for learning, assiduity, and unsparing application of the birch; none the less for his own loyalty and piety, and the grateful affection of his pupils. He was a most successful teacher, and at one time could point to no less than sixteen occupants of the bench of bishops who had been educated in his school. Among his pupils were Dryden, Locke, South, Atherbury, Philip Henry, and Bishop Hooper. He published several works, but they were chiefly for school use, and left money to found lectureships and to educate poor boys in his native place.

Busby, a military head-dress worn by hussars, and, in the British army, by horse artillerymen also. It consists of a fur hat with a short bag hanging down from the top on its right side, of the same colour as the facings of the regiment, and an upright plume in front. The origin of the name is obscure, but seems to be Hungarian, and it is said that the bag is a remnant of an ancient Hungarian long padded bag hanging down over the right shoulder to ward off sword-cuts.

Busch, WILHELM (1832-1908), humourist, was born near Hanover, and began in 1859 to draw humorous sketches for the *Fliegende Blätter*, the series called *Max und Moritz* appearing in 1860. He subsequently published in book-form *Der Heilige Antonius*, and a numerous series of witty and satirical sketches with rhyming texts.

Büsching, ANTON FRIEDRICH, geographer, was born in 1724 in Schaumburg-Lippe, and died, the director of a gymnasium in Berlin, 28th May 1793. Until the appearance of his unfinished *Erdbeschreibung* (1754-92), neither Germany nor any other nation possessed a geographical work which made any pretension to scientific treatment or completeness of execution.—His son, Johann. (1783-1829), published many works on old German literature, art, and antiquities.

Busenbaum, HERMANN, was born in 1600 in Westphalia, and died rector of the Jesuit College at Münster, 31st January 1668. His *Medulla Theologicæ Moralis* (1645) became a standard authority in Jesuit seminaries, though several of its propositions were condemned by the popes, and it has gone through more than fifty editions (one in 2 vols. Louvain, 1848). On the occasion of Damien's attempt on the life of Louis XV. in 1757, it was publicly burned as containing a justification of regicide. 'When the end is lawful, the means also are lawful,' is perhaps its most famous maxim.

Bush Antelope, also called BUSH BUCK, and BUSH GOAT, names common to a number of species of Antelope (q.v.), natives chiefly of the southern and western parts of Africa. According to some naturalists, they form a distinct genus (*Cephalophus*). They are animals of more compact form, shorter limbs, and greater strength, but much less agility, than the true or typical antelopes. They are remarkable for the arched form of the back. They have short, straight, or slightly curved horns, situated far back, and often peculiar to the male sex, with usually a long tuft of hair between them. They have no tear-pits, but instead of them, a naked glandular furrow, formed of two series of pores, on each cheek. They frequent jungles, thick forests, and beds of reeds, and when pursued, seek to escape by diving into a thicket. The commonest species is the Duyker (*C. mergens*), living in pairs in the bushy districts of South Africa. It stands about 20 inches high at the shoulder; the horns of the female are small and hidden by the hair-tuft. Among the numerous species of bush buck, the pigmy form or Kleenebok (*C. pygmæa*) is hardly larger than a hare.

Bushel (Old Fr. *boissel*, through Low Lat. perhaps from Gr. *pyxis*, 'a box'), a dry measure used in Britain for grain, fruit, &c. The quarter (abolished 1923 by the Corn Sales Act, 1921, as a measure for the sale of dry produce) contains 8 bushels, and the bushel 8 gallons, the gallon measuring 277·274 cubic inches, and holding 10 lb. avoirdupois of distilled water. Hence the imperial bushel, introduced in 1826, contains 80 lb. of water, at temperature 62° F., with barometer at 30 inches, and has a capacity of 2218·2 cubic inches.

Bushy, a Hertfordshire urban district, 1½ mile SE. of Watford, where Sir H. Herkomer established his art school in 1882; pop. 8000.

Bushido, the ancient Japanese code of chivalry inculcating honour, courage, loyalty, courtesy, and self-control. Since the abolition of chivalry it has continued as a powerful influence. It has raised the status of woman. See the article JAPAN; Knapp, *Feudal and Modern Japan* (1897); Nitobe, *Bushido, the Soul of Japan* (1900).

Bushire, or ABUSHEHR ('father of cities,' also variously written Bushahr; in Persian, Bender-shehr), a principal port of Persia, on a sandy peninsula on the east shore of the Persian Gulf, in the province of Fars. The climate is most unwholesome, and the streets are narrow, ill paved, and dirty. The district is liable to be devastated by earthquakes and the simoom, and is deficient in water; but the situation is highly favourable for commerce. A great part of the exports go to Britain and her colonies. Bushire is the land terminus of the Indo-European telegraph line, and a chief station of the British Indian Steam Navigation Company. A railway has been built to Borazdjan. The chief exports are grain, opium, tobacco, raw cotton, woollen goods (carpets), fruits, perfumery, silk, and horses; the imports, cotton and woollen goods, sugar, metals, indigo, tea, spices, chinaware, and glass. Bricks stamped with cuneiform characters have been found in the vicinity, at Rishire, which is believed to have been an Elamite settlement. Pop. 27,000, chiefly Persians, Arabs, and Armenians.

Bushmaster, a very deadly South American snake (*Lachesis mutus*) of the Crotalidæ.

Bushmen, or BOSJESMANS, are a nomadic race found in South Central Africa, especially in the Kalahari Desert, where they subsist on game and the desert roots. In appearance the Bushmen are thin and wiry, but not dwarfish; poor and debased when found near the Cape, but of improved appearance and intelligence farther northwards. They do not cultivate the soil, build no huts, have no cattle or goats, wear only a few rough skins for clothing, and do not gather round a king or chief; at one time a numerous race, they are now rapidly becoming extinct. In some of the mountain caves which they have inhabited, rude paintings and sculpture are to be seen displaying real artistic talent. Although they resemble the Hottentots (q.v.) in colour and features, the relationship is by no means clear. The languages of both abound in clicking sounds, but have little or nothing else in common. The two races are grouped with the Negritos (see ETHNOLOGY); and some authorities connect them with the Semang in Malacca, the Andamanese, and the Aetas in the Philippines. Others think they may represent the palæolithic man whose traces are found in Britain and western Europe, notably the peoples who carved figures of mammoths on tusks of ivory in prehistoric France, and the cave-painters of northern Spain. Bleek divided the Bushmen clicks into five—dental, cerebral, lateral, palatal, and labial; they have also two croaks, one strong and one gentle. For the history, see Theal's works

on South Africa; see also *Specimens of Bushman Folklore*, by Bleek and Lloyd (1912).

Bushnell, HORACE (1802-76), born at New Preston, Connecticut, graduated at Yale in 1827, and in 1833 became pastor of a Congregational church at Hartford. He held that human language cannot accurately express theological dogma, and was—erroneously—accused of heresy as to the Trinity. His chief books are *Nature and the Supernatural* (1858), *The Vicarious Sacrifice* (1865), and *Forgiveness and Grace*. See his *Life* by his daughter (New York, 1880).

Bushrangers, in Australia, originally runaway convicts, who had taken to the 'bush' and become robbers. In the early years of the 19th century they established a reign of terror in what was then the sparsely settled Van Diemen's Land. In 1814 two officials of Port Dalrymple 'unlawfully absconded into the woods,' and 'put themselves at the head of divers profligate and disorderly persons,' of whom the proclamation names 27, including one Michael Howe, who afterwards assumed the title of 'King of the Ranges,' and escaped killing until 1818. Though most of these men surrendered or were pardoned, many would appear to have immediately resumed their course of plunder, until in 1815 martial law was proclaimed in the district by the lieutenant-governor. Stern measures were taken to repress the crime; under Governor Arthur (1824-36) 103 criminals were executed within two years. In 1830 a drastic Bushranging Act was passed in New South Wales, where at one time a band of fifty desperadoes in the Bathurst district fought regular engagements with the settlers and police, and only surrendered when a detachment of the 39th Foot was brought up from Sydney. Ten of these men were executed, and the Act, which was renewed in 1834, put a stop to bushranging on this scale. Outbreaks still occurred at intervals, as in 1840; but generally only three or four ruffians would band themselves together, and after a more or less brief and desperate course, their career would come to an untimely end, through the untiring and gallant service of the small body of mounted police. These early bushrangers were all of one class—escaped convicts whose hand was against every man, since their mere escape made them outlaws, and they must rob to keep themselves alive. Their only friends and harbourers were convicts like themselves, hutkeepers on the outlying stations; their lairs were in wild mountain gullies; their crimes (beyond mere robbery) were deliberate, unnecessary, motivated by savagery and revenge. But with the gold rush of the 'fifties a new type of bushranger came into being. The small farmers of those days, crowded off the open country by big sheep-runs, had to cultivate fertile patches in the gullies; their sons saw little or no chance of getting land to farm at all. At the same time great wealth in portable form was being taken past their doors along lonely roads from gullies still farther out. In New South Wales particularly the diggings were isolated and far from the settlements; and it was in New South Wales, therefore, that the new type of bushranger flourished most—gangs of young freemen, many of them sons of farmers, nearly all befriended by the small settlers, and attacking only gold escorts, mails, travelling traders with money, and stations when they happened to need good horses. Robbery was their object, and killing a thing to be avoided as long as possible; and while this was so, the police and the squatters were their only enemies, and they worked almost unscathed. It was only when they took to unprovoked murder that they became enemies of society. Ben Hall's gang, the most notorious of the lot—six men in all, with a leader of twenty-five years and followers ranging down to

seventeen years—robbed escorts, fought the police, besieged squatters in their own homes, seized townships, held up traffic on the main roads (with sixty prisoners in one man's charge), for nearly three years with practical impunity. But early in 1865 they began to shoot policemen unprovoked; the leaders were dead by May, and the last of the gang was hanged in March 1866. By the early 'seventies this form of bushranging had almost died out, partly because the police had been strengthened and the roads were better patrolled, partly because the spread of settlement under new land laws had absorbed the adventurers who had been the strength of the gangs. But in 1878-79 the Kelly brothers, the last of a gang of horse-stealers which had for many years operated in north-eastern Victoria, murdered a constable, took to the bush, and tried to imitate and surpass the most notable exploits of former gangs. But, while the bush-rangers of the 'twenties and the 'sixties were almost inevitable products of abnormal states of society, the Kellys were a mere excrescence. Their violence and their theatrical posings attracted more attention than they were worth; and when an astounded community began to recover its balance they were hunted down with comparative ease, though the manner of their final defeat was melodramatic in the extreme. See Boxall's *Story of the Australian Bushrangers* (1899).

Bush-shrike is the name of a sub-family of Formicariidæ, all American, and resembling the Butcher-bird (q.v.) or Shrike in their habits.

Busiu. See BUZAU.

Busk, GEORGE (1808-86), surgeon and biologist, was born at St Petersburg, the son of an English merchant. He studied in London, became a naval surgeon, but from 1855 devoted himself to scientific work, becoming an authority on the Bryozoa, on palæontology, and on anthropology. He was Hunterian professor of comparative anatomy and physiology, and president of the Royal College of Surgeons.

Busk, HANS (1815-82), one of the originators of the Volunteer movement, studied at King's College, London, and Trinity College, Cambridge, and became high-sheriff of Radnor in 1847. In spite of Melbourne's discouragement he founded a rifle club at the university; helped in 1858 to revive the only existing Volunteer corps, the Victoria Rifles.—RACHEL H. BUSK (1818-1907), his sister, published collections of folk-tales.

Busoni, FERRUCCIO BENVENUTO, born at Empoli, 1st April 1866, of Italian and German parentage, taught in Helsingfors, Moscow, Boston, and elsewhere, and settled in Berlin. Recognised first as one of the great pianists of his day (especially in Bach), he gained renown later by such compositions as his pianoforte concerto, *Doktor Faust*, and other operas. He wrote a *Sketch of a New Aesthetic of Music*.

Buss, FRANCES MARY (1828-95), promoter of the higher education of women, was the founder of the North London Collegiate School for Ladies. See her Life by Annie E. Ridley (1896).

Bussahir. See BASHAHR.

Bussorah. See BASRA.

Bussy-Rabutin, ROGER, COMTE DE (1618-93), French soldier and courtier, was imprisoned and exiled for his *Histoire amoureuse des Gaules*, a book of partly fictitious court scandals (1666). His *Mémoires* and his letters to his cousin Mme de Sévigné and others have been published.

Bust (Fr. *buste*, Ital. *busto*, Low Lat. *bustum*) is the sculptural representation, in the round, of the head and shoulders of a person, usually set on a

base or pedestal; and may be made of marble, stucco, clay, metal, wood, or wax. Busts may be portrait busts or be purely ideal. Portrait busts of great excellence were made by the later Greek sculptors; and the Roman artists, especially in the imperial period, produced excellent work. The *imagines* or portraits of ancestors preserved by the early Romans were mere masks of wax. The Greek *hermæ* (see HERMES) were not strictly busts. See SCULPTURE.

Bustard (*Otis*), a genus of birds, sometimes made the type of a family, Otididæ, usually ranked in the order of marsh birds like the cranes (Grallæ, q.v.). Bustards are birds of bulky form, with long neck and lank naked legs; the toes, three in number, all directed forward, short, united at the base, and edged with membrane; the wings rather rounded; the bill of moderate length, straight, or



Great Bustard (*Otis tarda*).

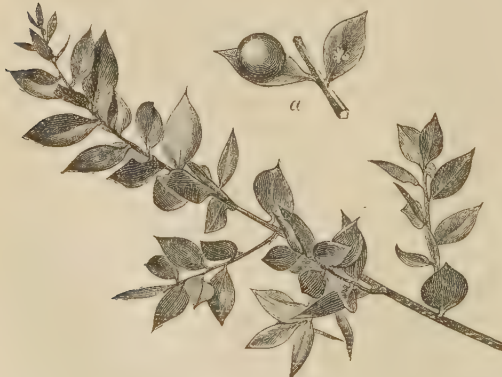
nearly so, with a wide gape; and in form not unlike that of a hen. They are mostly inhabitants of dry open plains, to which all their habits are adapted. They are shy but cunning, not well adapted for flight, live in companies, and feed on green parts of plants, seeds, insects, worms, &c. The nests are simple excavations in the ground.—The Great Bustard (*Otis tarda*) was at one time plentiful in some parts of England, and was also an inhabitant of the south-east of Scotland; but extending cultivation, and the persecution to which it has been subjected, have unfortunately banished it. It is common in the south and east of Europe, and yet commoner in the steppes of Tartary. It is the largest of European birds, the male sometimes weighing nearly 30 lb. A full-grown male is over a yard in length, and measures 8 feet from tip to tip of extended wings. The female is much smaller than the male. The bustards occur in small flocks, and are polygamous. The males fight freely. The maternal instincts are strong, though the nest is simple. Many of the young fall victims to birds of prey. The plumage is of a pale chestnut colour on the upper parts, beautifully varied with black; there is much white and black on the wings. The under side is whitish. The white-tipped tail is short, spreading, and rounded. A white whisker-like tuft of split-up feathers is present on each side of the throat in the summer dress of the male, and partly conceals a long stripe of bare skin on each side of the neck. The anatomy of the male exhibits a remarkable peculiarity in a large air-filled pouch, the entrance to which is between the under side of the tongue and the lower mandible.

There were only two 'doves' (each of above twenty birds) left in Norfolk early in the 19th century; the last case of bustards nesting in England was at Great Massingham in 1835 or 1836. At the end of the 19th century and beginning of the 20th attempts (not quite unsuccessful) were being made to re-introduce them here and there. The Great Bustard feeds indiscriminately on animal and vegetable food, swallows frogs, mice, worms, &c., and is very fond of the green tops of turnips. Its flesh is highly esteemed for its flavour. The sharp sight, quick movements, habit of appointing sentinels, &c., make them difficult game. No difficulty is found in taming it, but all attempts to reduce it to a state of true domestication have hitherto failed, from its not breeding in the poultry-yard.—The Little Bustard (*O. tetrax*), frequent in the south of Europe and north of Africa, is only an accidental visitant in Britain. It is not half the size of the Great Bustard.—The Collared Bustard or Hubara, a separate genus (*Eupodotis undulata*), occurs in North Africa and Arabia, and occasionally strays northwards.—The Black-headed Bustard (*O. nigriceps*) is found in large flocks in the open plains of the Mahratta country. Its flesh is esteemed one of the greatest delicacies which India produces.—The Kori Bustard (*O. kori*) of South Africa, a magnificent bird, standing upwards of 5 feet in height, has a similar reputation as one of the best kinds of game.—Australia possesses a bustard (*O. australasianus*) somewhat exceeding the Great Bustard of Europe in stature. It is called Wild Turkey by the colonists of New South Wales. Its plumage is finely freckled or spotted; the prevailing colour is brown. It has become comparatively rare in the more settled districts, its flesh being particularly delicate and well flavoured, but may be seen stalking majestically in the grassy plains where human footsteps are still rare.

Busto-Arsizio, a town of Northern Italy, 20 miles NW. of Milan. It has an interesting church, and some manufacture of cotton-thread. Pop. 20,000.

Butcher-bird, a name for various members of the Shrike family (Laniidae) of perching birds. The name refers to the habit the birds have of impaling on the thorns of hedge or bush the insects, mice, and small birds which they catch. They thus form a sort of larder which often presents a curious medley. The family is represented throughout the world, with the exception of South America. The Great Gray Shrike (*Lanius excubitor*) is one of the commonest of these butcher-birds, and has been sometimes seen as a winter migrant in Britain. See SHRIKE.

Butcher's Broom (*Ruscus*), a genus of ever-



Butcher's Broom (*Ruscus aculeatus*):
a, fruit.

green, usually dioecious, shrubs of the Asparagus

group of Liliaceæ, remarkable for their reduced leaves, which are mere scales, bearing in their axils flattened leaf-like branches (cladodes) which bear the flowers upon their surface (*R. aculeatus*) or round their edge (*R. androgynus*), and are often twisted at the base, so as to reverse their upper and under surfaces. *R. aculeatus* is the common Butcher's Broom, so called because used by butchers to sweep their blocks. It grows more commonly and luxuriantly in the south of Europe. The fruit is a red one-seeded sweetish berry. It grows well under trees or shrubs, and can often be advantageously introduced for ornamental purposes. The root was formerly used as an aperient and diuretic.

Bute, an island in the Firth of Clyde, Scotland, separated from the coast of Argyll by a narrow winding strait called the Kyles of Bute, mostly under a mile wide, about 6 miles distant from the west coast of Ayrshire, and 8 miles NE. of Arran. It is 15½ miles long, 1¼ to 6¼ miles broad, and 46 sq. m. in area. The surface to the north is high, rugged, and barren, attaining 875 feet in Kames Hill; in the centre and south it is low and undulating, and comparatively fertile. The coast is rocky, and has some bays. Of six small lakes, the largest is Loch Fad (2½ by ¼ mile), in a cottage on whose west shore lived Kean and Sheridan Knowles. The climate is milder than in any other part of Scotland, and though moist, less so than on the west coast generally; hence, Bute is much resorted to by invalids. In the south the soil is sandy; towards the north clay predominates. Most of the arable land is under tillage, and agriculture is in a good state. The chief crops are oats, turnips, and potatoes. The principal town is Rothesay (q.v.). Most of the island belongs to the Marquis of Bute, whose beautiful seat, Mount-Stuart, 5 miles south-south-east of Rothesay, has been rebuilt since the fire of 1877 at a cost of some £200,000. Among the antiquities of Bute are Rothesay Castle, Kames Castle (John Sterling's birthplace), Kilmorrie Castle, St Blane's Chapel; Dungyle, a remarkable vitrified fort on a high crag on the south-west coast; and the Devil's Caldron, a circular erection, the original purpose of which is not well known. From an early period till 1266 Bute was more or less subject to the Norwegians. The people of Bute are sometimes called *Brandanes*, presumably after the Saint Brendan (q.v.) whose name appears in Kilbrandon Sound, which separates Bute from Kintyre. Pop. (1801) 6106; (1841) 9499; (1911) 11,835; (1921, in holiday season) 19,465.

BUTESHIRE, a county comprising the isles of Bute, Arran, the Cumbraes, Holy Isle, Pladda, Inchmarnock, and some smaller islands. The area is 218 sq. m. Pop. (1871) 16,977; (1911) 18,186; (1921) 33,711. Buteshire, with northern Ayrshire, returns one member to parliament. The county town is Rothesay, in Bute.

Bute, JOHN STUART, third EARL OF, born in 1713, succeeded his father in 1723, and about 1737 attracted the favourable notice of Frederick, Prince of Wales, who made him one of his Lords of the Bedchamber. On the prince's death (1751), Bute became Groom of the Stole to his son, afterwards George III., over whose mind he obtained a strong influence. In March 1761 he was appointed one of the principal secretaries of state; and from 29th May 1762 to 8th April 1763 he was prime-minister. His government was one of the most unpopular that ever held office, its fundamental principle being the supremacy of the royal prerogative, of which the government were merely humble servants. According to Lovat-Fraser's book on him (1912) he was not incapable; but he was deemed by

the popular verdict, as set forth by a contemporary, 'unfit to be prime-minister of England, as (1) a Scotchman, (2) the king's friend, and (3) an honest man.' For some time he retained his influence over the king, but the last twenty-four years of his life were chiefly spent in complete retirement in the country. He died 10th March 1792.—His fourth descendant, John-Patrick Crichton-Stuart, born at Mount-Stuart, in Bute, 12th September 1847, in 1848 succeeded his father as third Marquis of Bute. Educated at Harrow and Christ Church, Oxford, in 1868 he was admitted into the Catholic Church by Monsignor Capel. He was author of several works, including a translation of the Roman Breviary (2 vols. 1879), and he was a contributor to this encyclopædia. He died 9th October 1900, his body being buried at Mount-Stuart, and his heart on the Mount of Olives at Jerusalem.

Butea, an Indian and Chinese genus of Leguminosæ (Papilionaceæ). The best-known species are *B. frondosa* (Dhak-tree) and *B. superba*. These trees present a gorgeous sight when covered with racemes of large orange-scarlet flowers. They yield a resinous exudation, which occurs in the form of lurid red tears, often covering the twigs, and is sometimes also called Bengal Kino (see KINO). The lac insect frequents the Dhak-tree, and yields a form of stick-lac (see LAC). The fibre is used for caulking boats, and the flowers yield a beautiful yellow or orange dye.

Butler, a flourishing city and capital of Butler county, Pennsylvania, on the Conequenessing Creek, about 30 miles N. of Pittsburg (45 by rail). It has woollen, flour, and planing mills, and plate-glass and carriage factories. The surrounding region is rich in natural gas, petroleum, and coal and iron fields. Pop. (1880) 3163; (1920) 23,778.

Butler, ALBAN, Catholic hagiographer, was born at Appletree, Northampton, in 1710. He was educated at Douai, and became professor there; was for some time chaplain to the Duke of Norfolk; and at his death (15th May 1773) was head of the English College at St Omer. His great work is the *Lives of the Saints* (4 vols. Lond. 1756-59).—His nephew, Charles Butler (1750-1832), was known as a lawyer and author on legal and theological subjects.

Butler, BENJAMIN FRANKLIN, an American lawyer, general, congressman, and governor of Massachusetts, was born at Deerfield, New Hampshire, 5th November 1818. His father, who had been captain under General Jackson, died soon after, and in 1828 his mother removed to Lowell, Massachusetts, which has ever since been his residence. Graduating at Waterville College (now Colby University), Maine, in 1838, and admitted to the bar in 1840, he became noted as a criminal lawyer, a champion of the working-classes, and an ardent Democrat. He served in the legislature in 1853, and in the state senate in 1859. At the Democratic National Conventions in 1860 at Charleston and Baltimore he strove to conciliate the southern leaders; but after secession he prepared for war, and as brigadier-general of militia responded to President Lincoln's call for troops with five regiments. On 16th May 1861 he was appointed major-general of volunteers, with the command of the department of Virginia. He refused to return the slaves who came to his headquarters at Fortress Monroe as being 'contraband of war.' Early in 1862 he commanded a military expedition against New Orleans, and after Farragut's fleets had passed the forts, took possession of the city on 1st May. The citizens were passionately devoted to the Confederate cause, but General Butler's prompt, vigorous, and severe

measures crushed all opposition, maintained order, and preserved public safety. In December he was superseded, but in November 1863 received a command in Virginia. His operations on the south side of the James in May 1864 were frustrated by the arrival of General Beauregard from Charleston. The canal which he had almost completed at Dutch Gap was disapproved by naval officers. In December, in his expedition against Fort Fisher, near Wilmington, North Carolina, a futile attempt was made to breach the walls by the explosion of a powder-boat. Returning to civil life, General Butler was elected to congress in 1866, and was prominent in the Republican efforts for the reconstruction of the southern states and the impeachment of President Johnson. During his twelve years' service he warmly advocated the issue of greenbacks as national currency. In 1878 and 1879 he was nominated for governor of Massachusetts, but defeated; in 1882 he was elected, but in 1883 was defeated. His nomination for president in 1884 was not taken seriously by the people. See his *Autobiography* (1892) and the *Life* by Bland (1879). He died at Washington, 13th January 1893.

Butler, GEORGE, D.D., born in London in 1774, from a school kept by his father in Cheyne Walk, Chelsea, proceeded to Sydney Sussex College, Cambridge, of which he was elected a fellow. He was head-master of Harrow from 1805 till 1829, when he retired to the Northamptonshire rectory of Gayton, and Dean of Peterborough from 1842 till his death on 30th April 1853.—GEORGE BUTLER, D.D., his eldest son, born in 1819, was educated at Harrow, at Trinity College, Cambridge, and at Exeter College, Oxford, where in 1841 he gained the Hertford, and in 1843 took a first-class in classics. He became vice-principal of Cheltenham College, and was principal of Liverpool College from 1867 to 1882, when Mr Gladstone gave him a canonry of Winchester. He was author of various religious, educational, and other works. In 1852 he married Josephine, daughter of the agriculturist, John Grey of Dilton (see WOMEN'S RIGHTS). He died 14th March 1890. See the *Recollections* by his wife (1892).—His youngest brother, HENRY MONTAGU BUTLER, D.D. (1833-1918), was educated at Harrow and Trinity College, Cambridge, where he was senior classic in 1855. He was head-master of Harrow from 1859 till 1885, when he accepted the deanery of Gloucester, to exchange it, however, next year for the mastership of Trinity.

Butler, JAMES. See ORMONDE.

Butler, JOSEPH, one of the most eminent of English divines, was born 18th May 1692 at Wantage, in Berkshire, the youngest of the eight children of a retired draper. With a view to the ministry of the Presbyterian Church, he attended a dissenting academy at Gloucester, afterwards at Tewkesbury, where the future Archbishop Secker was his schoolfellow. At the age of twenty-two, he gave proof of high metaphysical ability in a letter to Dr Samuel Clarke, usually appended to that celebrated writer's *a priori* demonstration, to which it offers some objections. About this time he made up his mind to join the Church of England, and in March 1714 entered Oriel College, Oxford. He graduated in 1718, and took orders; in the same year he was appointed preacher at the Rolls Chapel, where he preached those remarkable sermons which he published in 1726. The first three, *On Human Nature*, constitute one of the most important contributions ever made to moral science. The scope of the reasoning is, briefly, that virtue is consonant with, and vice a violation of, man's nature. He

became prebendary of Salisbury (1721), and rector of Houghton-le-Skerne near Darlington (1722); in 1725 he was presented to the 'golden rectory' of Stanhope, also in the county of Durham, to which he removed in the following year. Here he resided in great retirement till 1733, and is believed to have been busy on his *Analogy*. His friend Secker, the archbishop, desired to see him promoted to some more important position, and mentioned his name once to Queen Caroline. The queen thought he had been dead, and asked Archbishop Blackburne if it were not so. 'No, madam,' said the archbishop, 'he is not dead, but he is buried.' In 1733 Butler became chaplain to his friend Lord Chancellor Talbot, a D.C.L. of Oxford, and in 1736 a prebendary of Rochester, and clerk of the closet to Queen Caroline. In 1736 he published the great work of which the germs were contained in his three sermons, and which has entitled him, in the words of his eloquent disciple Chalmers, to be called the 'Bacon of theology.' The leading aim of the *Analogy* is to show that all the objections to revealed religion are equally applicable to the whole constitution of nature, and that the general analogy between the principles of divine government, as revealed in the Scriptures, and those manifested in the course of nature, warrants the conclusion that they have one Author. The argument is valid against the deists, but it lacks completeness as a defence of Christianity. Butler's greatness is mainly on the moral side. The deification of conscience is the beginning, middle, and end of his teaching. Duty is his last word. He puts the deists into a state of probation by plying them with arguments sufficient *in reason* to influence their practice, whether they may actually do so or not; whereas the true method of Christianity is to put something that tends to transform a man and his practice in such a way that he feels disposed and eager to lay hold of it. In 1738 he was made Bishop of Bristol; in 1740 Dean of St Paul's; in 1747 he is said to have been offered the primacy; and in 1750 he was translated to the see of Durham. In his charge in 1751 he pointed out, with characteristic depth of insight, the importance of a due maintenance of the externals of religion, as a means of keeping alive the thought of it in the minds of the people; but this subjected him to much censure as betraying a tendency to Roman Catholicism—an allegation unworthy now of serious notice. Butler's private character was such as became a Christian prelate; grave and judicious, he was at the same time meek and generous. He was kind and considerate to his clergy and people; his princely episcopal revenues he distributed munificently, as not his own. He died at Bath, June 16, 1752, and was buried in Bristol Cathedral.

His works are in a dry and uninteresting style. With a *Life* by Kippis, they were first published at Edinburgh (1804), and reprinted at Oxford (1807); there are separate editions of the *Analogy*, and of the *Three Sermons*; a *Life* by Bartlett (1839); and a short sketch by Collins (1881). Mr Gladstone published his monumental edition of the works in 1896 (2 vols., with a third volume of *Studies Subsidiary to the works*).

Butler, JOSEPHINE E. (1829–1906), daughter of John Grey of Dilton near Hexham, and wife (1852) of George Butler, Canon of Winchester, was born at Milfield. She was a prominent and very influential advocate of women's emancipation and social reform, on which she wrote several books.

Butler, SAMUEL (1612–80), burlesque satirist, son of a Strensham farmer, was educated at Worcester grammar-school, and perhaps Oxford or Cambridge. As secretary to Mr Jeffreys of Earls-Croome in Worcestershire, he is said to have occupied his leisure in the study of music and painting. In the service of the Countess of Kent he became

intimate with Selden, her steward. There is no ground for saying he was in the service of a Puritan gentleman, Sir Samuel Luke, of Cople Hoo, near Bedford, who is supposed to have sat for the portrait of Hudibras. After the Restoration he became secretary to the Earl of Carbery, Lord President of the Principality of Wales, by whom he was appointed steward of Ludlow Castle. About this time he took a wife, who brought him a competent fortune, which 'by being put out in ill securities . . . was little advantage to him.' The first part of *Hudibras* appeared in 1663; the second part in 1664 (a pirated second part having been published in the previous year); and the third part in 1678. In this witty and pungent satire on the Puritans Butler showed himself to be an inimitable master of burlesque. His command of rhyme was inexhaustible; his learning curious and copious; and his epigrammatic sayings are so happily phrased that some of them have been quoted from age to age, until they have passed into the language of daily life. The poem secured immediate popularity, and is said to have been a special favourite of Charles II. But Butler's loyalty and wit procured him no substantial preferment. All that he received from the king was a solitary grant of three hundred pounds, which he distributed among his creditors. Probably the accounts of his poverty have been exaggerated; and Aubrey hints that he had only himself to blame, for 'he might have had preferments, but he would not accept any but very good.' He is said to have been patronised in later life by the Duke of Buckingham; but there appears to be no foundation for the statement. Among Butler's posthumous *Characters* (of which the authenticity has not been assailed) is a very severe article on 'A Duke of Bucks.' From the Earl of Dorset, who introduced *Hudibras* to the king, he received some kindness. He died in Rose Street, Covent Garden, of a consumption, and was buried in the churchyard of St Paul's, Covent Garden, at the expense of his best patron, William Longueville of the Temple. In 1721 a monument was erected to Butler in Westminster Abbey. Aubrey described him as 'strong-set, high-coloured, a head of sorrel hair, a severe and sound judgment; a good fellow.'

See Z. Grey's edition of *Hudibras* (1744), and Waller's (1905); and B. Johnson's edition of the *Works* (1893).

Butler, SAMUEL, who was the son of the Rev. Thomas Butler, and the grandson of Dr Samuel Butler, headmaster of Shrewsbury School, and afterwards Bishop of Lichfield, was born at Langar in Nottinghamshire, 4th December 1835, and died in London, 18th June 1902. He was educated at Shrewsbury School under Dr Kennedy, whom he caricatured amusingly and not unkindly in *The Way of all Flesh*, and at St John's College, Cambridge, where he took his degree in 1858, having been bracketed 12th in the first class of the Classical Tripos. Butler had been designed for the church, but as the time for ordination approached he was assailed by conscientious scruples, and finally relinquished the idea of taking orders. In September 1859 he emigrated to New Zealand, where he remained until 1864. The greater part of this period was spent in sheep-farming upon a run situated among the head-waters of the river Rangitata, which was so successful that on his return to England Butler found himself possessed of enough money for his simple wants. He established himself in Clifford's Inn, London, where he lived until his death. It was his intention to devote himself to art, and he studied painting at Heatherley's School in Newman Street and other places. He became an author only, as it were, by accident. During his New Zealand days he had written several articles on subjects connected with evolution, which had appeared in the *Christchurch Press*.

At the suggestion of a friend he recast these articles, adding much to them and giving them a framework of Utopian adventure. The book in its completed form was published anonymously under the name of *Erewhon*.

The plan of the work—the adventures of a traveller in an imaginary Utopia—was of course traditional, but since the days of Swift it had not been employed with more conspicuous vigour and success. Butler was a master of delicate and trenchant irony, and he spared few of the follies and superstitious of modern life. Not unnaturally, considering its origin, *Erewhon* is rather a piecemeal affair, and the satire is occasionally somewhat erratic in its strokes, but the merely story-telling part of the book is admirably fresh and vivacious. The nucleus of the book, the reduction of the Darwinian theory to absurdity, has perhaps lost some of its power to interest a 20th-century audience, but the satire on the conventional attitude to religion in the chapter on the Musical Banks remains as mordant as ever, and the Erewhonian views of the relations that exist between disease and crime—topsy-turvy as they sounded then—have now many proselytes among modern thinkers.

Even the success of *Erewhon* did not convince Butler that literature was his vocation. He still continued to practise art, and looked upon writing merely as a recreation. *Erewhon* was followed in 1874 by *The Fair Haven*, an ironical defence of the miraculous element of Christianity, which was little understood and less appreciated, and in 1877, after a visit to Canada, which Butler undertook for the purpose of investigating the affairs of a company in which he was interested, by *Life and Habit*, in which, for the first time, he came into conflict with the views upon natural selection promulgated by Charles Darwin. By this time Butler had made up his mind that nature intended him for a writer—a decision that was emphasised by his admission as a reader to the Library of the British Museum, where he continued to work until his death, and where, as he himself admitted in one of his essays, he could alone compose freely. Evolution and kindred topics occupied him for some time.

Life and Habit was followed by *Evolution, Old and New* (1879), *Unconscious Memory* (1880), and *Luck or Cunning* (1886), a trio of controversial works, which, though less original in substance than *Life and Habit*, exhibit Butler as a dialectician of rare skill and the master of a brilliant prose style. But Butler's interests were too various to be retained even by so fascinating a subject as evolution. Between 1872 and 1885 he was engaged upon his semi-autobiographical novel *The Way of all Flesh* (posthumously published in 1903); in 1879 he returned to theological polemics in a series of articles contributed to *The Examiner* under the title 'God the Known and God the Unknown' (published in book form 1909), and in 1882 he published *Alps and Sanctuaries of Piedmont and the Canton Ticino*, a fascinating book of travel largely concerned with artistic questions. Art, in fact, although he had long since realised that he was not to win fame as a painter, still occupied a large share of Butler's thoughts. In *Ex Voto* (1888) he gave a characteristically detailed description of the Sacro Monte at Varallo, and incidentally rescued the sculptor Tabachetti from oblivion. About this time, too, he contributed a series of articles, dealing mainly with artistic matters, to the *Universal Review*, most of which are now included in *The Humour of Homer, and other Essays* (1913). *The Humour of Homer* itself was a lecture delivered in 1892 to an audience of artisans. For the next five years Butler was much occupied with Homeric

questions, the numerous articles that he wrote upon the subject being finally merged in *The Authoress of the Odyssey* (1897), in which he proved to his own satisfaction that the poem was written at Trapani, in Sicily, by a young woman who depicted herself as Nausicaa. Meanwhile he had written a biography of his grandfather, the Bishop of Lichfield, *The Life and Letters of Dr Samuel Butler*, which gives a curiously interesting picture of the clerical and scholastic life of the early part of the 19th century, and, after studying music with the well-known theorist Rockstro, he had written and published, in collaboration with his friend Mr Henry Festing Jones, a cantata, in the Handelian style, entitled *Narcissus* (1888). This was followed by the posthumously published oratorio *Ulysses* (1904), in which also he had the advantage of Mr Jones's collaboration. Butler paid further tributes to the genius of Homer in prose translations of the *Iliad* (1898) and the *Odyssey* (1900), and he turned to a fresh field in his critical edition of Shakespeare's *Sonnets* (1899). Butler's last work revived memories of an earlier triumph. Thirty years after the appearance of *Erewhon* he published a sequel, *Erewhon Revisited* (1901), in which the hero, who at the close of the earlier work had escaped in a balloon, returns to find himself the central figure of a new religion founded upon the supposed miracle of his ascent to heaven. Even the natural disposition of mankind to find a sequel less interesting than its predecessor could not blind critics to the strength of *Erewhon Revisited*. As a work of art it is infinitely superior to *Erewhon*. The earlier book, written as it was at different times, pieced together by the hand of a literary novice, and dealing with subjects of various quality and interest, inevitably lacked regularity and cohesion. The later work is a more harmonious whole. The interest is concentrated upon a central idea, the story is developed with a firmer and more vigorous touch, and the writing has a maturer felicity of style.

Butler made little headway with the public during his lifetime. *Erewhon*, it is true, astonished and delighted the literary world, but *The Fair Haven* alienated the sympathies of the orthodox; *The Authoress of the Odyssey* repelled scholars, *Alps and Sanctuaries* and *Ex Voto* seriously fluttered the artistic doves; and *Life and Habit* and its successors raised up powerful and relentless enemies in the field of science. During the greater part of his career Butler was a literary pariah, and his books were received with contemptuous silence or undisguised hostility. His reputation for irony did him harm with his contemporaries.

A humorist is not easily accepted as a teacher, and in an age of specialism Butler's versatility was an argument against him. It was often convenient for those who found his reasoning unanswerable to take refuge in the pretension that the author of *Erewhon*, whatever he chose to write about, was not to be taken seriously, and Butler, though he justly resented this attitude, could not resist the occasional temptation of playing into the hands of his opponents by juggling with paradoxes. His death was the signal for a remarkable turn in the tide of his popularity, and the completion of another decade saw him acclaimed as one of the most remarkable writers and thinkers of the latter part of the 19th century.

Butler's work is not easy to sum up in a word. He gave his own view of his life's achievement in a note which will be found in the posthumously published *Note-books of Samuel Butler*, p. 374, and is a sufficiently remarkable testimony to his energy and versatility. But the value of Butler lies in his destructive rather than in his creative work. His humorous philosophy is a potent, if

subtle, acid, under the action of which the priggishness and humbug of modern life dissolve into nothingness. Butler is the apostle of common-sense, the apologist of the *via media*. His genial Laodiceanism, however repulsive to the idealist, offers a practical, if somewhat inglorious, solution to many of the problems of life, and it is in such teaching as his that the conflicts of extremists find a tranquil reconciliation. See *Life* by H. Festing Jones (1919).

Butler, WILLIAM ARCHER (1814-48), religious and philosophical writer, was born at Annerville, near Clonmel. The child of a mixed marriage, he turned Protestant while still a schoolboy at Clonmel, and two years later entered Trinity College, Dublin, where he was appointed professor of Moral Philosophy in 1837.

Butler, LIEUT.-GENERAL SIR WILLIAM FRANCIS, K.C.B. (1838-1910), was born at Suirville in Tipperary, and became an ensign of the 69th regiment in 1858. He served on the Red River Expedition, was sent on a special mission to the Saskatchewan (1870-71), served in Ashanti (1873), in Natal (1879), and in the Sudan (1884-85). He had the Cape command in 1898-99, but was recalled before the war because his views on the Transvaal difficulty were not 'Imperialist'; and he retired from the Aldershot command in 1905. He wrote *The Great Lone Land* (1872), *Wild North Land* (1873), *Akimfoo* (1875), *Far Out* (1880), and *Lives of Gordon, Sir Charles Napier, and Pomeroy Colley*. In 1877 he married ELIZABETH SOUTHERDEN THOMPSON, born at Lausanne about 1843. She studied at home, in Florence, and in the School of Art, Kensington. Her first Academy picture, 'Missing,' was exhibited in 1873, and in the following year the 'Roll Call' established her reputation as a spirited and faithful painter of military subjects. Her 'Quatre Bras' (1875) drew praise from Ruskin. She has also illustrated poems by her sister, Mrs Meynell. See her *Autobiography* (1923).

Butlerage, otherwise called the *prisage* of wines, was a right exercised by the crown in England to take two tuns of wine from every ship (English or foreign) importing into England twenty tuns or more, which, by charter of Edward I., was

exchanged into a duty of two shillings for every tun imported by merchant strangers, and called butlerage, because paid to the king's butler.

Butomus, a genus of Butomaceæ, an order of aquatic monocotyledons sometimes called Marsh-lilies, of which one species, *B. umbellatus*, is frequent in ditches and ponds in England, Ireland, and many parts of Europe. Some think it the most beautiful



Butomus.

ful of British plants. The leaves are all radical, 2 to 3 feet long, linear, triangular, their sharp edges sometimes cutting the mouths of cattle, whence the generic name (Gr., 'ox-cutting'). The flowering stem bears a large umbel of rose-coloured flowers, readily distinguished by their nine stamens,

six in pairs opposite the outer perianth, and three opposite the inner.

Butt, DAME CLARA, a popular singer with a remarkable contralto voice, was born at Southwick, 1st February 1873, and studied at the Royal College of Music. In 1900 she married the baritone, Kennerley Rumford (b. 1870).

Butt, ISAAC, a great Irish patriot, the first to make political use of the phrase 'Home Rule,' was the son of a Protestant rector, and was born in County Donegal in 1813. Educated at Raphoe and at Trinity College, Dublin, he gained a brilliant reputation for his accomplished scholarship, edited the *Dublin University Magazine* from 1834 to 1838, and filled the chair of Political Economy in his university from 1836 to 1841. He was called to the Irish bar in 1838, and ere long became a foremost champion of the Conservative cause, actively opposing O'Connell's Repeal Association in 1843. His political conversion occurred early, for in 1852 he was returned as a 'Liberal Conservative' for Youghal, for which constituency he sat until 1865. He defended Smith O'Brien and others in the state trials of 1848, and with equal fearlessness and self-devotion all the Fenian prisoners between the years 1865 and 1869. In 1871 Butt was returned for the city of Limerick to lead the Home Rule party, but soon found that he could not control them. He died 5th May 1879.

Butte, a mining city of Montana, U.S., 73 miles by rail SSW. of Helena. In the vicinity are numerous mines of gold, silver, and copper. Settled in 1864 as a placer-mining camp, Butte has a pop. of 42,000.

Butter is produced from milk by collecting the fatty globules contained therein and incorporating them in a solid mass, this being effected by mechanical means, as by the use of a churn. The mechanical action of the Churn (q.v.) overcomes the surface tension, which keeps the fat floating in the milk in the form of small globules, allowing these globules to coalesce. The composition of an average sample of butter is as follows: fat, 85 per cent.; water, 11.9 per cent.; casein and albumen, .6 per cent.; milk sugar, .5 per cent.; and ash and salt, 2 per cent. The government standard for butter forbids a greater percentage of water than 16. The butter fat is, again, composed of a number of separate fats or glycerides, the chief being Palmitin and Olein, these two making up over 70 per cent. of the total fat. The typical fats, however, which give to butter its distinctive character are Butyrin and Caproin, these being present to the extent of 7.8 per cent. of the fat.

The following is the most economical way of producing marketable butter. The milk, on being drawn from the cow, is passed through a separator, which divides the cream from the skim-milk by the action of centrifugal force. In factories where large quantities of milk are dealt with the temperature at which separating is carried out is 125° F., but in small private dairies the milk is put into the machine at the body heat of the cow, care being taken that the temperature is not allowed to fall below 85° F. The cream, on being drawn from the separator, is placed in glazed earthenware crocks to ripen. Through ripening, a greater quantity of butter is produced from a given bulk of cream by decreasing the adhesive effect of the casein. The temperature at which the ripening-room should be kept is between 56° and 60° F. The process of ripening is brought about by the action of the lactic acid bacteria, and should be completed in about thirty-six hours in the case of a sample of cream from one separation. In small dairies the evening's cream is added to that produced in the morning, and so on for two or three days, until a sufficient

quantity is obtained for churning; under these conditions the ripening period is prolonged. The addition of each new lot of cream must be followed by stirring to give an even condition of ripeness to the whole. Under no circumstances should any cream be added within twelve hours of churning. In order to expedite ripening, a 'starter' in the form of a specially prepared culture of the lactic acid bacillus, which is a commercial article, may be used, or the same effect is produced by adding a little sour buttermilk from a previous churning.

Before putting the ripened cream into the churn, the latter must be prepared by washing—first with cold water, then with scalding water, and finally with cold, this last water being left in the churn for about twenty minutes, and run off before putting in the cream. The temperature of the churn will be roughly that of the air in the dairy, being usually about 56° F., and the cream should be at the same temperature when poured into the churn. The cream temperature may with advantage be slightly raised in winter and lowered in summer. The commonest type of churn at the present time is the so-called end-over-end churn, into which the cream is strained through a muslin, care being taken never to fill the receptacle more than half-full. The lid being fixed, the churn is now revolved, slowly, gradually increasing the speed to fifty revolutions per minute, slowing down again as the butter begins to 'break.' As a quantity of gas is liberated in churning, it is necessary to allow it to escape through a valve provided for the purpose. Under normal conditions the butter should 'break' in from twenty-five to thirty minutes, this being discernible by the clearing of a small glass indicator fitted in the lid of the churn. On the churn-lid being removed the butter will be found to be in the form of fine grains. In order to harden these a small quantity of water known as 'breaking water' is added, and a few more revolutions may then be given if the grain is very small. The buttermilk is now drawn off through a hair sieve, thus preventing the loss of any small particles of butter. This is followed by two or three washings, until the washing water comes away from the churn perfectly clear. The temperature of the washing water should be about 45° F. in summer and never below 50° in winter. The last washing water is not drawn off until the butter floating therein has been removed by means of a wooden scoop and hair sieve to the butter-worker. The butter-worker is briefly a sloping oblong table over which a fluted roller passes, the object being to expel from the butter the surplus water it contains. The butter, when dry and firm, is made up on a butter-board into various shapes, depending on the district, a common form being pound or half-pound rectangular blocks, wooden butter-pats (called 'Scotch hands') being used in the process.

Fresh butter contains no salt, but its keeping qualities are very limited. To increase the keeping capacity salt is added either by dry-salting or brining. In dry-salting, the purest salt is added to the butter when on the worker, at the rate of $\frac{1}{2}$ oz. per lb., and thoroughly incorporated. For brining, 1 or 2 lb. of salt is dissolved in 1 gallon of water, and this is used for the final washing in the churn, the butter remaining in it over half-an-hour.

In summer when butter is realising a low price it is sometimes advantageous to preserve or pot for winter use. In potting butter the following points should be particularly attended to: Wash very carefully when in the granular state in the churn, add salt on the worker at the rate of $1\frac{1}{2}$ oz. per lb., working thoroughly and giving the salt time to dissolve, being careful to expel as much of the moisture as possible; pack into glazed crocks which have been thoroughly scalded and cooled,

consolidating the butter carefully to leave no air-spaces. A final layer of two inches of salt is placed on the top of the butter, and a vegetable parchment tied securely over all.

As butter is sometimes of a pale colour, artificial colouring may be resorted to, and this is best carried out by the addition of extract of Annatto (q.v.), which is added to the cream before churning and thoroughly mixed, the amount of extract used being $\frac{1}{2}$ to 1 drachm in three gallons of cream.

In place of using the separator as previously described, the cream may be obtained from the milk by setting in pans and allowing the action of gravity to leave the lighter cream on the surface of the liquid, whence it is removed by hand-skimming. This, together with the old-fashioned method of churning whole milk, is rapidly disappearing on account of the extra labour entailed and the loss of fat which is left in the milk.

The manufacture of butter in dairy factories (see DAIRY) is now becoming common in this country, the system having been in vogue for some time in America and Denmark. The handling of large quantities of milk on the co-operative system allows of the use of the best dairy machinery, and the subsequent production of butter which can be turned out in large bulk and of a uniform excellence of sample; whereas much variation is noticed when butter comes from a number of small private dairies.

BUTTERMILK is the residue of cream after the butter has been removed by churning, and it forms a wholesome, easily digestible, and nourishing drink in hot weather, possessing a slightly acid taste owing to the acidity developed in ripening the cream. It retains the ash casein and sugar of the whole milk, together with a small amount of fat left from the incomplete separation of the butter. Buttermilk is a valuable food for pigs, and on dairy-farms is largely used as such; in the household it is much in request for cooking purposes.—Less familiar is the artificially soured milk, rich in lactic acid, and recognised by Metschnikoff as valuable in intestinal disorders due to decomposition caused by bacteria, and in fermentative dyspepsia. The use was introduced into western Europe from Bulgaria about 1905.

A number of substitutes for butter are prepared from various animal and vegetable fats, which can only be distinguished from real butter by chemical analysis.—MARGARINE is an artificial butter which was first prepared in 1870 from the recipe of the French chemist Mège Mouriès, who devised the product to form a cheap substitute for butter for the poor of Paris. The fat from which this artificial butter was made was originally ox fat; but as the supply of this material failed to meet the demand owing to the increase in the manufacture of margarine, other animal and vegetable fats were made use of, such as pork fat, mutton fat, cocoa-butter (see COCOA), coconut oil (see COCONUT), olive-oil, cotton-seed oil, &c. There is of late a prodigiously increased demand in Europe for coconuts and coconut oil—no longer for the use of soap-makers mainly, but for the manufacture of margarine and butter substitutes (nut-butter, 'nutter,' &c.) for the table, for cooking and other domestic purposes, as well as for the use of biscuit-bakers and confectioners. In the manufacture of the best margarine beef fat is still largely employed, and the process is roughly as follows: The fat is first finely minced, then placed in jacketed tanks, and raised to a temperature of about 100° F. The fat is then skimmed, and the clear matter removed from the heavier portion, which remains at the bottom of the tanks. This clear material is subjected to pressure, which extracts the oils and leaves the harder fats. To this oily substance the name of oleomargarine is given, and it is mixed

with milk and annatto as a colouring ingredient, and the mixture churned at a high speed. The margarine is then cooled with water at a low temperature, and subsequently put through rollers to expel moisture, dry salt being added during the working process. The percentage of insoluble fatty acids is considerably higher in margarine than in butter, although the total fat content of the two is practically identical. Margarine, when carefully prepared, forms a safe and cheap substitute for butter; but its use as an adulterant in the genuine article, and its sale as butter, had a depressing effect on the dairy industry. To prevent products not prepared entirely from cow's milk being sold as butter or butterine, the Food and Drugs Acts of 1887, 1899, and 1907 forbid the sale of artificial butters except in properly stamped cases marked 'Margarine,' while the amount of butter fat and water contained in the preparation may not exceed 10 per cent. and 16 per cent. respectively. All premises where margarine is prepared must be registered and open to inspection.

In America the Oleomargarine Law (1886) forbids the sale of any mixtures of animal and vegetable fats except under the name of Oleomargarine.

In chemistry 'butter' is used not merely of such substances as the oils of palm, coconut, shea, nutmeg, &c., but of certain oily metallic substances—thus we have butter of Antimony (q.v.), of bismuth, zinc, and tin.

Butter-bur (*Petasites vulgaris*) is a perennial Composite, common in wet meadows and beside streams, whose huge simple and somewhat rhubarb-like leaves form a very characteristic foreground in such landscapes. The whitish-purple flower-heads, borne in exuberant racemose masses, come up like those of its ally Coltsfoot (*Tussilago*, q.v.), in early spring, before the leaves. *P. fragrans*, or Winter Heliotrope, has bluish flower-heads.

Buttercup is a name given to various species of *Ranunculus* (q.v.).

Butterfield, WILLIAM (1814–1900), called 'the Fra Angelico of Architecture,' excelled in Gothic, with colour by means of brick, stone, marble, and mosaic. The best-known works by him are Keble College, Oxford; St Augustine's College, Canterbury; the Chapel and Quadrangle of Rugby; All Saints', Margaret Street, London; and St Albans, Holborn.

Butterfish. See GUNNEL.

Butterflies, or RHOPALOCERA, a series of Lepidoptera mostly diurnal in their activity, in contrast to the Moths (q.v.) or Heterocera, most of which fly in the twilight or at night. Butterflies may be fairly called the favourite insects; the ravages committed in their caterpillar stage seem absolved by the grace and beauty of their adult life; the contrasts of their life-history have formed the subject of oft-repeated parables; the richness and variety of their colouring make them at once the cruel delights of boyhood and the living jewels of the artist; their thousand variations have for long afforded scope for the unwearying labours of the entomologist; while their ethereal winged beauty has appeared to many a poet fitly symbolic of the human soul.

Zoological Position.—The Lepidoptera form one of the highest orders of insects, with these general characters—there are four wings covered with flat scales often beautifully coloured; the veins or nervures are not numerous; the mouth-parts of typical adults are most conspicuously represented by a coiled protrusible proboscis, but the larva has biting mandibles; there is an abrupt and complete metamorphosis, the Caterpillar (q.v.) stage being succeeded by a quiescent pupa, out of which the imago or winged adult emerges. They

are almost exclusively vegetarian insects, and depend on the fluid parts of what they eat. In many cases the feeding is practically confined to the larval stage. There are probably some 50,000 species, the British list by itself numbering about 2000. They are often unscientifically divided into Macro- and Micro-lepidoptera, and there is not much scientific value in the division into butterflies and moths. The former usually have the antennæ knobbed or thickened a little before the tip; the latter have the antennæ of various shapes, very rarely knobbed, usually thread-like, spindle-shaped, or feathery. Moreover, most of the moths have a 'frenulum,' consisting of one or more bristles, on the hind wing anterior to the insertion, and linking on to a flap or tuft on the fore wing. It may be noted that butterflies form a much more natural assemblage (excepting the Hesperidæ or Skippers) than do the moths, which are very heterogeneous. There are believed to be about 13,000 species of butterflies, and about 70 in Britain.

Structure.—Butterflies vary in spread of wing from under an inch to about eight inches (in some female Ornithopteras). The characteristic flat scales to which the name Lepidoptera refers (*lepis*, 'a scale'; *pteron*, 'a wing') are modified setæ or hairs of various shapes, and are arranged on the wings somewhat like the slates on a roof. Their colouring is usually due to contained pigment (sometimes of the nature of waste-products) and to fine surface striations which produce 'interference' or iridescent effects. Scales may occur along with hairs on the body, and there are all transitions between hairs and scales. In many male butterflies certain scales (androconia) on the wings produce fragrance, which is sometimes like flower-perfume and probably attractive. Sometimes, especially in large, conspicuous, slowly flying butterflies, very repulsive odours, probably of protective value, are produced by both sexes from special patches of scales or from the general wing surface. The head bears large compound eyes and frequently a pair of well-hidden simple eyes on the dorsal surface. The knobbed antennæ and the typical coiled proboscis (due to the outer parts of the first maxillæ) have been already referred to. The mandibles are absent or vestigial; the labial palps are usually well developed. Some butterflies use their proboscis to suck up fluid food, such as nectar from the flowers; others seem hardly to eat at all. There is a very small collar-like prothorax, a very large mesothorax, and a smaller metathorax, all free from one another. The long slender legs are covered with scales, and the tibiæ of the front pair often show on their inner aspect a peculiar mobile pad. The relatively large wings have few nervures (not exceeding fifteen at the periphery), and there is usually but one 'cell' (an area completely enclosed by nervures). In flight the fore and hind wings act as one, the anterior part of the hind one being overlapped by and pressed against the posterior part of the fore one. The abdomen has as usual nine or ten segments, but only six or seven are readily seen. As to the internal structure,



Fig. 1.—Mouth Parts of Cabbage Butterfly (after Leunis):

a, suetorial tube formed from first pair of maxillæ; b, the labial palps belonging to the second pair of maxillæ. At the base of the former, hints of upper lip, mandibles, and part of second maxillæ can be seen.

The mandibles are absent or vestigial; the labial palps are usually well developed. Some butterflies use their proboscis to suck up fluid food, such as nectar from the flowers; others seem hardly to eat at all. There is a very small collar-like prothorax, a very large mesothorax, and a smaller metathorax, all free from one another. The long slender legs are covered with scales, and the tibiæ of the front pair often show on their inner aspect a peculiar mobile pad. The relatively large wings have few nervures (not exceeding fifteen at the periphery), and there is usually but one 'cell' (an area completely enclosed by nervures). In flight the fore and hind wings act as one, the anterior part of the hind one being overlapped by and pressed against the posterior part of the fore one. The abdomen has as usual nine or ten segments, but only six or seven are readily seen. As to the internal structure,

it is not markedly divergent from that of typical insects. The supra- and sub-oesophageal ganglia are coalescent; the three thoracic ganglia are close together; and there are four ganglia in the abdomen. There is at the beginning of the abdomen, in front of the stomach, a blind sac which appears to be a food-storing reservoir. There are six excretory or Malpighian tubes and complicated reproductive organs.

Sexes.—In many cases the males are more brilliant than the females, the disparity reaching a climax in such genera as *Papilio* and *Ornithoptera*. Thus of *O. paradisea* found in New Guinea Dr Sharp writes: 'The female is a large sombre creature of black, white, and gray colours, but the male is brilliant with gold and green, and is made additionally remarkable by a long tail of unusual form on each hind wing.' In some cases, however, e.g. *Colias edusa* in Britain, and in many species of *Pieris*, the female excels the male in colouring; in many cases the two sexes are alike. Mr J. T. Cunningham calls attention to the interesting and probably important point that 'in a large number of instances the difference in coloration between male and female of the same species is precisely of the same kind as the difference between the upper and lower surfaces of the wings in the individual.' Darwin regarded the diverse coloration of the sexes in butterflies as in great part the outcome of sexual selection, the females being supposed to give a constant preference to the more brilliant males. Wallace, on the other hand, regarded this view as unsupported by evidence and as also quite inadequate to account for the facts. In

with a head and thirteen segments, with biting mandibles, with three pairs of jointed thoracic appendages and a number of more fleshy abdominal 'prolegs.' The caterpillars feed voraciously, grow quickly, and moult their cuticle several times. Finally they pass into the quiescent pupa or chrysalis stage, during which the larval body is metamorphosed into that of the winged butterfly. There is a process of histolysis, or breaking down of tissue, and of histogenesis, or establishment of new tissue—the plan or architecture of the body being thus profoundly altered. The wings are formed at the end of the caterpillar stage, but are fastened down to the body by a glutinous secretion which forms a shell over the chrysalis. There is usually a posterior terminal projection called the 'cremaster' or anal armature, to which silk threads are often attached, which bind the pupa to a support or allow it to hang freely. There may also be a silk thread girdling the middle. In the Skippers (*Hesperiidae*) the caterpillars conceal themselves in caves of leaves, and the pupa is similarly sheltered. It may also form a rudimentary cocoon, which is very rare among butterflies. The adult that emerges from the pupa skin has its wings soft and crumpled, but they soon expand and become firm. The butterfly's life is usually short, and there is sometimes more than one brood in the course of the year.

Seasonal Dimorphism.—In some cases the generation developed at one season is markedly different in coloration and outline from that developed at another season. There may be summer and winter forms, or 'wet' and 'dry' season forms; and these have been repeatedly referred to different species.

In the European form *Araschnia* (or *Vanessa*) *levana-prorsa*, the *prorsa* generation flies about in the summer; its progeny pass the winter as pupae and hatch out in spring as a *levana* generation. Weismann and others have proved that an artificial change of temperature during the pupal stage will change the characters of the resulting butterfly. Thus what should emerge a *prorsa* will, in artificial cold, become a *levana*. Weismann suggested that during the glacial ages there was probably only the *levana* form, and that the summer form *prorsa* has been evolved since. In the North American *Papilio ajax* (see fig. 2) there are three forms—*P. ajax*, *P. telamonides*, and *P. marcellus*. The offspring of *P. ajax* spend the winter as pupae; those that emerge early (before the middle of April) are of the form *mar-*



Fig. 2.—Seasonal Dimorphism—Two forms of the same species (*Papilio ajax*):
a, var. *telamonides*; b, var. *marcellus*.

cellus; those that emerge late (between the middle of April and the end of May) are of the form *telamonides*. Those butterflies that appear later in the summer are of the *ajax* type. There is much that is both interesting and puzzling in seasonal dimorphism; thus it has been shown in some cases that each form is particularly well adapted to particular conditions. In one of the leaf butterflies, *Kallima paralekta*, the dry season appearance is borne by the females and the wet season appearance by the males.

Life History.—The eggs, which differ considerably in shape, have chitinous shells often beautifully sculptured. They are usually deposited singly here and there, but sometimes there are many close together. They are generally laid on the leaves or branches of those plants on which the caterpillars feed. Out of the egg there emerges a small Caterpillar (q.v.), smooth, hairy, or spiny,

with a head and thirteen segments, with biting mandibles, with three pairs of jointed thoracic appendages and a number of more fleshy abdominal 'prolegs.' The caterpillars feed voraciously, grow quickly, and moult their cuticle several times. Finally they pass into the quiescent pupa or chrysalis stage, during which the larval body is metamorphosed into that of the winged butterfly. There is a process of histolysis, or breaking down of tissue, and of histogenesis, or establishment of new tissue—the plan or architecture of the body being thus profoundly altered. The wings are formed at the end of the caterpillar stage, but are fastened down to the body by a glutinous secretion which forms a shell over the chrysalis. There is usually a posterior terminal projection called the 'cremaster' or anal armature, to which silk threads are often attached, which bind the pupa to a support or allow it to hang freely. There may also be a silk thread girdling the middle. In the Skippers (*Hesperiidae*) the caterpillars conceal themselves in caves of leaves, and the pupa is similarly sheltered. It may also form a rudimentary cocoon, which is very rare among butterflies. The adult that emerges from the pupa skin has its wings soft and crumpled, but they soon expand and become firm. The butterfly's life is usually short, and there is sometimes more than one brood in the course of the year.

Protective Coloration.—There is considerable variability in the colouring of butterflies, and according to Darwinian interpretation this has supplied the material on which natural selection has persistently operated until at last there resulted such perfect protective resemblance as we see in various species of *Kallima*, the Dead-Leaf Butterfly (see fig. 3). In this genus the upper surface of the wings, conspicuous during flight, is brightly coloured; the under surface, exposed when the butterfly settles down and folds its wings together vertically above its body, is like a withered

leaf, not only in general, but in detail, decayed spots included.

Sometimes the coloration is modifiable, rather than variable. That is to say, it changes according to external influences—e.g. of temperature, illumination, or humidity. This has been proved experimentally in a number of cases, and it holds of some caterpillars and pupæ, as well as of adults.

Mimicry.—Many butterflies are like unrelated species, and this is interpreted on the theory of mimetic resemblance. A palatable species may



Fig. 3.—*Kallima Inachis* (from Carus Sterne):
a, flying; b, at rest.

escape being eaten if it resembles an unrelated nauseous species living in the same locality (Batesian mimicry). Or a number of inedible unrelated forms may be profited if they resemble one another, the theory being that the mimicry spreads the risk of being eaten by birds, and that it enables the birds more readily to master the association of a particular type of coloration with unpalatability (Müllerian mimicry). In some cases there is a very interesting resemblance between butterflies and insects of another order altogether; thus one of the Skippers has a curious resemblance to a grasshopper of the genus *Tettix*. The facts of mimicry are very striking, and often very puzzling on any theory. The whole question remains under consideration (see MIMICRY). Sometimes there are extraordinary complications. Thus Poulton gives examples showing that the male and female of a mimetic species may resemble different models; that the male may resemble one model, and two kinds of female two others; that a non-mimicking male, e.g. *Papilio dardanus* (*merope*), may be accompanied by two, three, or even four forms of female mimicking different models.

Distribution.—The occurrence of plants suitable for the caterpillars must obviously be an important factor in determining the geographical distribution of butterflies, but they are represented in every part of the globe. South America is richest of all, and New Zealand poorest. Gerstäcker notes that at a single point in Brazil three times as many butterflies occur as in the whole of Germany, and Wallace declared that it used to be possible to collect 600 different kinds of butterflies around the city of Pará. In the North Polar regions explorers have captured various species, several belonging to genera (*Colias*, *Argynnis*, *Lycæna*, &c.) common in the temperate zones. Even in the short summer of Greenland and Spitsbergen butterflies occur. Heilprin notes that M. Bonpland observed butterflies on the slopes of Chimborazo, at an elevation of 16,626 feet. Some gorgeous forms found in tropical America and elsewhere are remarkable not only as 'the most splendid insects in creation,' but on account of their migrations. In his work on Ceylon,

Sir James Tennent describes 'the extraordinary sight of flights of these delicate creatures, generally of a white or pale-yellow hue, apparently miles in breadth, and of such prodigious extension as to occupy hours and even days uninterruptedly in their passage, whence coming no one knows, whither going no one can tell.'

Bates found 550 distinct species of butterflies at Ega in the Upper Amazon country. Eighteen species of the swallow-tail genus (*Papilio*) were found within ten minutes' walk of his house. 'The number and variety of gaily tinted butterflies, sporting about in the grove on sunny days, were so great that the bright moving flakes of colour gave quite a character to the physiognomy of the place. It was impossible to walk far without disturbing flocks of them from the damp sand at the edge of the water, where they congregated to imbibe the moisture.' The gay individuals were almost all males, and 'every afternoon as the sun was getting low, the gaudy sunshine-loving swains might be seen trooping off to the forests, in the shades of which their more soberly dressed and immensely less numerous sweethearts and wives were confined.'

Hooker, describing the scenery on the banks of the Great Runjeet in the Sikkim Himalaya, says that 'by far the most striking feature consisted in the amazing quantity of superb butterflies, large tropical swallow-tails, black, with scarlet or yellow eyes on their wings. They were seen everywhere, sailing majestically through the still, hot air, or fluttering from one scorching rock to another, and especially loving to settle on the damp sand of the river-edge, where they sat by thousands, with erect wings, balancing themselves with a rocking motion, as their heavy sails inclined them to one side or the other, resembling a crowded fleet of yachts on a calm day.'

Classification.—Butterflies have been classified in various ways, but in recent arrangements particular attention has been paid to the character of the front pair of legs (which are often smaller than the others and different in shape), the claws on the feet, the nature of the tibiae, and so on. The following six families are often recognised: (1) *Nymphalidæ*, including the many sub-families, the Danaids, e.g. the *Danais*; the Ithomiids, e.g. *Ithomia*; the Satyrids, e.g. the British Meadow-browns, Heaths, and Marbled-whites; the Morphids, e.g. the giant *Morpho*; the Brassolids, e.g. the giant *Caligo*; the Acraeids; the Heliconiids of tropical America, very modifiable in their colouring; the Nymphalids, e.g. the Peacock, the Red Admiral, the Tortoise-shells, the Painted Lady (*Pyrameis cardui*), 'the most ubiquitous of the butterfly tribe,' the Purple Emperor (*Apatura iris*), the Dead-leaf Butterfly (*Kallima*); (2) *Erycinidæ* or *Lemoniids*, with one species in Britain, the Duke of Burgundy Futilary (*Nemeobius lucina*); (3) *Lycænidæ* or Blues; (4) *Pieridæ*, e.g. Garden-white, Brimstone, Clouded-yellow, and Orange-tip; (5) *Papilionidæ*, e.g. many magnificent species of *Papilio* and *Ornithoptera*; (6) *Hesperiidæ* or Skippers, the most distinct of the butterfly-families, with somewhat hook-shaped antennæ, with a peculiar jerky flight, with larvæ as well as pupæ concealed, and often with crepuscular habits.

Biological Importance.—The old butterfly-collecting was more a matter of æsthetic than of scientific enthusiasm, but to the modern naturalist the various species are much more than beautiful curiosities to be named and pinned—they are emblazoned pages in the history of nature's processes. 'This tribe,' Bates wrote, 'is better adapted than almost any other group of animals or plants to furnish facts in illustration of the modifications which all species undergo in nature, under changed local conditions.' The simplicity and obtrusive-

ness of the specific characters, the large number of species, the facility with which series of specimens can be collected and compared, account for this superiority. 'It may be said that on the expanded membranes of the wings nature writes, as on a tablet, the story of the modifications of species, so truly do all changes of the organisation register themselves thereon. Moreover, the same colour-patterns of the wings generally show, with great regularity, the degrees of blood relationship of the species. As the laws of nature must be the same for all beings, the conclusions furnished by this group of insects must be applicable to the whole organic world; therefore the study of butterflies—creatures selected as the types of airiness and frivolity—instead of being despised, will some day be valued as one of the most important branches of biological science.' On many of the deepest questions of biology—such as variation, modification, heredity, sex-dimorphism, adaptation—the study of butterflies has thrown and continues to throw much light.

Brief notices of a few of the principal kinds of butterflies will be found in other parts of this work. See CABBAGE-BUTTERFLY, CAMBERWELL BEAUTY, MIMICRY, PURPLE EMPEROR, &c.

Literature.—Bates, *Naturalist on the Amazon* (as to mimicry); Poulton, *Essays on Evolution* (1908) (as to mimicry); Darwin, *Descent of Man*, chap. xi. (as to sexual selection); Wallace, *Darwinism* (as to coloration); Weismann, *Studies on Theory of Descent* (1880) (seasonal dimorphism); Poulton, *Colours of Animals* (1890); Beddard, *Animal Coloration* (1892); Weismann, *The Evolution Theory* (1904) (coloration); S. H. Scudder, *Butterflies*, (New York, 1881) and *Butterflies of New England* (1889); Humphreys and Westwood, *British Butterflies and their Transformations* (1841); D. Sharp, *Cambridge Natural History*, vol. vi. (1899); Ch. Janet, *Les Papillons* (Paris); M. Standfuss, *Handbuch der paläarktischen Gross-Schmetterlinge* (Jena, 1896). For British butterflies one of the most convenient books is South's (1906). A great work on European butterflies is Herrich-Schäffer's *Systematische Beschreibung der Schmetterlinge von Europa* (5 vols.), and on tropical Lepidoptera, *Exotische Tagfalter* (3 vols.) by Staudinger, Schatz, and Röber (1884–1887).

Butterfly Fish. See BLENNY.

Butterfly Orchis (*Oncidium Papilio*), an orchid of Trinidad and Venezuela, of which the flowers have an extraordinarily close resemblance to a brown-spotted yellow butterfly. It is a frequent inmate of our hothouses. *Phalenopsis anabilis* is also sometimes called Indian Butterfly Orchis.

Butterfly Weed, or PLEURISY ROOT (*Asclepias tuberosa*, see ASCLEPIAS), a plant common in the United States, of which the root has medicinal repute, the infusion being used as a diaphoretic and expectorant.

Butterine, Buttermilk. See BUTTER.

Buttermere, a Cumberland lake, 9 miles SW. of Keswick. Lying 247 feet above sea-level, it is $1\frac{1}{4}$ mile long, $\frac{1}{2}$ mile wide, 90 feet deep, and is united by a short stream to Crummock Water (240 feet, $2\frac{3}{4}$ miles by $\frac{3}{4}$ mile, 130 feet deep), which discharges into the Cocker.

Butternut (*Juglans cinerea*), a North American species of Walnut (q.v.).

Butter-rock, or HALOTRICHITE, is an iron alum, appearing as a pasty exudation on rocks that contain Alum (q.v.) or its constituents, particularly alum-slate and other schistose rocks.

Butter-tree (*Bassia*) is a genus of tropical or subtropical trees of the natural order Sapotaceæ (q.v.), remarkable for the abundance of oil or butyraceous fat which the seeds contain, and which is used for many purposes by the inhabitants of the countries where they are indigenous.—The Mahwa or Mowra of India (*Bassia latifolia*) attains a height of 40 to 60 feet, like a good oak in size, and

is a valuable timber-tree. Its flowers last two or three weeks, and then fall; they are eaten raw, and have a luscious taste when fresh; when dry, they resemble figs in flavour. They are a valuable source of food, especially in the Central Provinces, and a kind of arrack or spirit is distilled from them. Alcohol for power purposes can be got from them in great quantities, and very cheaply. They may also be employed as a very abundant source of sugar. One tree may produce 800 lb. of flowers. The seeds of the apple-like fruit yield by expression a considerable quantity of a greenish-yellow fat, which is used for the manufacture of margarine, soap, and candles, for burning in lamps, and occasionally by the poorer classes for frying food.—The Indian Butter-tree, or Phulwara or Fulwa Tree (*B. butyracea*), a native of Nepal, attains a height of 50 feet. Its timber is light and of no value. The fruit is of the size of a pigeon's egg, and although eaten, is not much esteemed; but from the seed a fat or butter is obtained by expression of a delicate white colour, much valued for medicinal uses and as an unguent, and employed also to adulterate ghi.—The seeds of the Illupi (*B. longifolia*), of Coromandel, yield a large quantity of oil, which is used for lamps, for making soap, candles, and chocolate, and in cookery. The flowers are eaten, and the wood is almost as hard and durable as teak.—The butter-tree (*Butyrospermum Parkii*) described by Mungo Park as growing in the interior of Africa, in the country of Bambarra, is nearly allied. It produces the Galam Butter, also called Shea Butter (i.e. Tree Butter), which is highly valued, and forms an important article of internal commerce in the interior of Africa. The seeds of the fruit, which resembles an olive, are dried in the sun, or in a peculiar kind of oven, and the kernels are then boiled in water in order to obtain the butter from them, which not only keeps for a whole year without salt, but is also said to be whiter, more solid, and more pleasant to the taste than true butter. This butter is used both as an article of food and of medicine, and it would seem that the tree would reward cultivation elsewhere in the tropics.—The name Butter-tree is also given to other tropical trees, whose fruits yield fixed oils, having the appearance and used for the purposes of butter. Thus the butter-trees of Guiana and Brazil belong to the genus *Caryocar* (q.v.), of Caryocaraceæ, the West African butter-tree to the genus *Pentadesma*, of Guttiferæ (q.v.). The Oil-palms (q.v.) and the *Cocos butyracea* (see COCONUT) may also be regarded as butter-trees. See also TALLOW-TREE.

Butterwort (*Pinguicula*), a genus of Lentibulariaceæ (q.v.), small plants with a characteristic rosette of large spreading entire radical leaves, common in bogs and marshes. The Common Butterwort (*P. vulgaris*) is abundant in the northern parts of Britain and of Europe, and grows in Canada. Its leaves are covered with sessile and stalked glands, which yield a viscous insect-catching secretion (hence *pinguicula*, 'greasy'), which also contains acid and



Common Butterwort
(*Pinguicula vulgaris*):
a, a flower.

pepsin, and has active digestive properties (see INSECTIVOROUS PLANTS). Hence it has also the power of coagulating milk, and is used for this purpose by the Laplanders. Some species possess flowers of much beauty, especially *P. grandiflora*. *P. lusitanica*, found on the W. coasts of Britain, has migrated from Portugal.

Buttmann, PHILIPP, was born at Frankfort in 1764, and studied at Göttingen under Heyne. He became in 1789 assistant in the Royal Library at Berlin, and rose successively to be secretary and librarian (1811). He held at the same time (1800-8) a professorship in the Joachimsthal Gymnasium in Berlin. He died 21st June 1829. Buttmann is best known by his Greek grammar (1792; 22d ed. 1869) and *Lexilogus* (2 vols. 1818-25; 2d ed. 1860), both of which have been translated into English.

Buttons. A button is a disc, generally circular, prepared to attach to clothing, other textiles, and to leather, for fastening edges or for ornamentation. Buttons are made from innumerable materials and combinations, and their methods of manufacture and ornamentation are as varied as the materials from which they are made. Whilst defying classification, three groups may be distinguished by their methods of attachment to clothing: first, buttons sewed on through their substance, such, e.g., as linen-covered metal rings used for underclothing; second, buttons pierced with two or more (generally four) holes through which they are sewed, of which trouser-buttons are a type; and, third, buttons having tangs or tabs on their under side for attachment. A further trade distinction is drawn between military, naval, livery, and other uniform buttons, generally of stamped metal, and the endlessly varied buttons of civil life.

Button-making as an industry does not date farther back than the days of Queen Elizabeth, and in England Birmingham has always been its principal seat. In the 18th century the trade, chiefly in brass and gilt metal buttons, attained great prosperity, and about the same time costly steel buttons, brilliantly cut and faceted, came into great vogue. Matthew Boulton, subsequently partner with James Watt, was a maker of these costly steel buttons. Early in the 19th century Mr B. Sanders introduced the cloth-covered button, which initiated the change from those made of metal. His son in 1825 effected the improvement of making it with a canvas tuft instead of a metal shank, which does less injury to the garment. The shell, consisting of two discs of thin metal, the cloth covering in front, the canvas on back to form the tuft, and the millboard stuffing, together make up a covered button. All these parts are circular and separately punched out of sheets. In the punching of the front metal disc its periphery is at the same time turned up. The back disc or collet is made in a similar manner, but a hole is made in the centre of this to let the tuft or flexible shank protrude. All the component parts being ready, a workman using a press with a punch and die unites them firmly together. He first covers the front part of the shell with the silk, and subsequently, by the introduction of a round steel tool into the press, he unites this with the collet and its accessories.

In 1841 the old Dorsetshire wire and thread button was replaced by the 'three-fold linen button,' still considered indispensable for underclothing, since neither washing nor mangling quickly destroys it. The linen covering of this button is held fast by the pressed-down edges of a groove in its internal brass ring.

Soon after coloured tweed coats began to be worn, in the 19th century, brass buttons of an

ornamental kind were used for them. Heads or entire figures of animals, for example, were stamped upon the buttons, and they were bronzed (see BRONZING) in various tints to match approximately the colour of the cloth. Except for livery servants and other special purposes, it is chiefly trouser-buttons that are now made of metal. These are largely produced from rolled sheet-brass. The blanks are punched out either by a hand or steam press and are afterwards stamped, which operation depresses the centre and thickens the margin. The holes are also punched out.

Buttons of Vegetable Ivory (q.v.), the fruit of *Phytalephas macrocarpa*, called commercially corozo nuts, are now all but universally used for tweed coats and vests. It is not unlike true ivory but softer, and is easily turned and dyed. These buttons are often mottled with some stain to suit the common patterns of tweed stuffs. Thousands of tons of corozo nuts are consumed every year in the manufacture of buttons, especially in Italy and Czechoslovakia. The seeds of the dum palm are not so good for button-making. Various kinds of wood, such as beech, box, rosewood, lignum-vite, zebra-wood, and walnut are manufactured into buttons. Wood moulds or cores for ladies' buttons, which are covered with cloth of the same pattern as a dress, are made in enormous numbers in the south of France.

Mother-of-pearl buttons are formed of the beautiful substance of which the large flat shell of the pearl-oyster consists, and this has long been a favourite material for buttons. Small cylinders are first cut out of the shells with a tubular saw. These are then split into discs, which are shaped by a steel tool, drilled with holes, and finally polished with rotten-stone and soft soap, or by a more recent method with ground charcoal and turpentine. Shirt-studs as well as flat and globular buttons with metal shanks are also made of this substance. See MOTHER-OF-PEARL.

Among other animal substances used for buttons are ivory, bone, horn, and hoof. From this last so-called 'horn buttons' were made by pressing them in heated dies in which the design was cut. There are many kinds of composition buttons, as of Celluloid (q.v.), ebonite, &c.

Glass buttons are made in great variety. For 'pinched' buttons small rods of coloured glass are heated at the ends, and pressed into shape by means of a pair of rather long hand-pliers, on the ends of which are a die and its counterpart, likewise kept hot. Other kinds are cut out of coloured sheet-glass, which is coated on the back with tin-amalgam like a mirror. Along with other varieties, some beautiful glass buttons are made in Bohemia, either partly or wholly of aventurine glass; and of this 'gold'-spangled material artistically inwrought with other colours, studs and solitaires still more remarkable for their beauty and minute patterns are made at Venice.

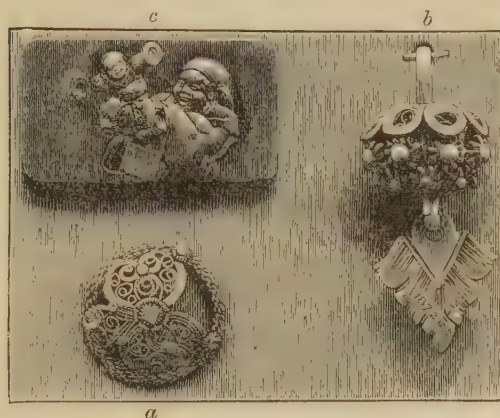
Porcelain buttons, at one time nearly all of French manufacture, are now made principally at Prague. Some are plain, and others are painted or printed with patterns.

The mandarins' buttons of China are official badges worn in the caps of state officials. There are nine grades in each branch of the public service, and each grade is distinguished by a different colour or other marking of the button.

More or less expensive buttons are made of ornamental stone, such as agate, jasper, and marble. Occasionally they are formed of amber, jade, or of still more costly materials, as pearls and gems. As to other materials, a Birmingham manufacturer says it were easy to write out a long list from which buttons have been made, but very difficult to name one from which they have *not* been made.

In recent years improved methods and machines have been introduced for the shaping as well as for the polishing and finishing of bone, corozo, and wood buttons. Machinery is used in Germany for the manufacture of composition buttons, and there is an American machine for performing automatically all the operations in manufacturing covered buttons.

In England, Birmingham is the seat of the button trade, which, however, is much more largely developed in France. But both countries suffered in the competition in the markets of the world with Austria. In the United States



buttons are principally made at New York and Philadelphia.

It is only rarely that a button is a thing of beauty apart from the material of which it is made. The annexed illustrations, however, show two of silver filigree as worn on dresses in Norway (a) and Iceland (b), which have some claim to artistic merit, and the third (c) represents one of many Japanese buttons or *netsukes*, in which the skill and fancy of a true artist is still more apparent.

Buttonwood. See PLANE.

Buttress, a projection for the purpose of giving additional support or strength to a wall. In the classical style there were no visible buttresses, their structure being, to a certain extent, supplied or concealed by pilasters, antæ, &c. The different stages of Gothic architecture are marked by the form of buttresses employed, almost as distinctly as by the form of the arch. In early Romanesque the buttresses frequently presented the form of a pillar, after the tradition of classic art. The Norman buttress was generally broad, with slight projection, and finished on top with a splay against the wall; but it was also occasionally semicircular, like a half column applied to the wall. Early English buttresses project much more boldly, and are considerably narrower than the Norman. They are frequently broken into stages, which diminish in size as they ascend. In the Decorated style, this division into stages is almost invariable, the buttress being often supplied with niches terminating in pinnacles, and very highly ornamented with carving, statues, &c. In the Perpendicular style they frequently assume more fantastic forms, sometimes presenting a sharp external angle and being adorned with applied pinnacles, &c. Flying buttresses are half arches thrown from detached piers or buttresses against the upper parts of vaulted structures in order to abut and carry off the outward pressure of the arches. This expedient for supporting lofty vaults was first invented in France in the 12th century.

It became one of the chief factors in the growth of the Gothic school, and, crowned with lofty pinnacles, the French buttresses formed one of



Buttresses, Amiens Cathedral:
a, buttresses; b, flying buttress.

the principal decorations of the exterior of French cathedrals. They were introduced into England at the period of the Early English.

Butua Root. See PAREIRA BRAVA.

Butyl. See ALCOHOL.

Butyric Acid, C_3H_7COOH , is a volatile fatty acid, first prepared by Chevreul, by treating butter with an Alkali (q.v.). It possesses the disagreeable odour of rancid butter, and it is to it, in part at least, that the perspiration of animals owes its unpleasant smell. It is a mobile liquid, specific gravity .974, the vapour of which is inflammable, burning with a blue flame. It is readily soluble in water and alcohol, possesses a sour burning taste and corrodes the skin.

While butyric acid itself and its inorganic salts (butyrates of sodium, calcium, &c.) have a disagreeable smell, it is interesting to note that the organic salts (butyrates of methyl, ethyl, &c.) have a pleasant odour, and are used in the manufacture of artificial fruit essences.

The principal source of the acid is from *butyric fermentation*. To a solution of glucose, sour-milk, cheese, and chalk are added, and the mixture kept at a temperature of 35° C. Ferments in the cheese and milk cause fermentation of carbohydrate. As the acid is formed it is neutralised by the chalk, as otherwise an accumulation of acid would arrest fermentation. By treating with hydrochloric acid and then distilling, butyric acid is separated.

Butyric Ether, or PINE-APPLE OIL, is an exceedingly fragrant oil obtained by distilling butyric acid (or the butyrate of lime), alcohol, and sulphuric acid. The material which passes over is the butyric ether, and it is generally mixed with alcohol, and sold in commerce as *Artificial Pine-apple Oil*. It possesses the same very pleasant flavour which belongs to pine-apples, and there is little doubt that pine-apples owe their flavour to the presence of natural butyric ether. The artificial variety is now extensively used for flavouring confections, as pine-apple drops, for sophisticating

bad rum, and for flavouring custards, ices, and creams, as also an acidulated drink or lemonade named Pine-apple-Ale. Butyric ether alone cannot be used in perfumery for handkerchief use, as, when inhaled in even small quantity, it tends to cause irritation of the air-tubes of the lungs and intense headache, but it is employed as one material in the manufacture of compound perfumes. Butyric ether is the butyrate of ethyl, $C_2H_5.COO.C_2H_5$, and is similar to butyrate of sodium, $C_2H_5.COO.Na$, in composition, the sodium, Na, being in this case replaced by the organic radical ethyl, C_2H_5 . It is remarkable that a substance possessing such a disagreeable odour as butyric acid should be capable of forming, in part at least, a substance with such a pleasant flavour as artificial pine-apple oil.

Butyrospermum. See BUTTER-TREE.

Buxar, or BAXAR, a town of Shahabad district, Bihar, on the south bank of the Ganges, 411 miles NW. of Calcutta by rail. It has a large central jail where tents are manufactured. Here in 1764 Sir Hector Munro defeated a confederation of Hindu princes under Mir Kassim. Pop. 10,000.

Buxbaumia, a small genus of mosses. *B. aphylla*, very rare in Britain, is remarkable for its exceedingly reduced scaly leaves.

Buxton, a town in Derbyshire, 37 miles NW. of Derby, and 25 SSE. of Manchester. It lies 1025 feet above sea-level, in a deep valley surrounded by hills and moors, which have been tastefully planted; and the only approach is a narrow ravine, by which the Wye flows into the Derwent. Chee Tor, 5 miles to the east, is a perpendicular limestone rock rising to a height of 300 feet from the Wye, while 3 miles to the south-west is Axe Edge (1810 feet). Buxton has long been famous for its calcareous springs, tepid (82° F.) and cold (discharging 120 gallons of water per minute), and its chalybeate springs. They were probably known to the Romans, and in 1572 were celebrated by one Dr John Jones as 'the ancient baths of Buckstones.' The town is visited both in summer and winter by many thousands of persons, the waters being taken for indigestion, gout, rheumatism, and nervous and cutaneous diseases. The Devonshire Hospital (claiming to have the widest dome in Europe) treats thousands of poor patients with the waters every year. The baths and public walks are numerous. Much of the splendour of Buxton is due to the dukes of Devonshire, one of whom in 1780, at the cost of £120,000, erected an immense three-storied pile of buildings called the Crescent, a curve of 200 feet, with wings each of 58 feet. It includes several hotels, a town-hall and free library (1891), assembly rooms, &c. Near Buxton are the Diamond Hill, famous for its crystals; and Poole's Hole, a stalactite cavern of great length. Mary, Queen of Scots, was at Buxton when in the custody of the Earl of Shrewsbury. Pop. (1871) 3717; (1881) 6021; (1921) 15,651.

Buxton, SIR THOMAS FOWELL, philanthropist, was born in 1786 at Earls Colne, Essex. Educated at Kingston, and under Dr Burney at Greenwich, from 1803 to 1807 he studied with brilliant success at Trinity College, Dublin, whilst his youth was distinguished by a strong development of animal energy, natural enough to a young Englishman whose full stature exceeded 6 feet 4. In 1807 he married a sister of the celebrated Mrs Fry, and in 1808 entered business as a brewer, with an energy which in due time was crowned with splendid prosperity. His warm religious and moral impulses soon brought him prominently forward as an advocate of philanthropic interests. The relief of the Spitalfield weavers and the reform of prison discipline formed early subjects of his efforts. In 1818 he entered parliament as member for Wey-

mouth, which he continued to represent till 1837, taking a prominent part in every debate on such questions as the amelioration of criminal law and prison discipline, suttee abolition, and slave emancipation. The last in particular engrossed a large share of his activity for many years. In 1824, at Wilberforce's request, he succeeded him as head of the anti-slavery party; and no man on that side displayed more indomitable zeal and firmness. He lost his seat through his opposition to bribery, and refused ever after to stand for a constituency. His philanthropic labours, however, ended only with his life. In 1840 he received the well-merited distinction of a baronetcy. He died 19th February 1845, and a statue has been erected to him in Westminster Abbey. See *Memoirs of Sir T. Fowell Buxton* (1848), edited by his third son, Charles (1823-71), who sat in parliament as an independent Liberal from 1857, and who, like his father, was a partner in the brewery of Truman, Hanbury, Buxton & Co.

Buxtorf, JOHANN, Hebraist, was born in 1564 at Kamen, in Westphalia; in 1591 became professor of Hebrew at Basel, and died there of the plague in 1629. In a knowledge of rabbinical literature, he surpassed all his contemporaries. The most important of his numerous works, the *Lexicon Chaldaicum Talmudicum et Rabbinicum*, was completed by his son (Basel, 1640), and has been recast by Fischer and Gelbe (2 vols. Leip. 1866-74). See *Life* by Kautzsch (1879).—His son, JOHANN, was born at Basel in 1599, and at five years of age—according to his rather credulous biographers—could read German, Latin, and Hebrew. To perfect his knowledge of these tongues he visited Holland, France, and Germany; and in 1630 he succeeded his father in the chair of Hebrew at Basel, where he died in 1664. He published a number of treatises, commentaries, and translations. His son, Jakob (1645-1704), and his nephew, JOHANN (1663-1732), both succeeded to the Hebrew professorship.

Buxus. See BOX.

Buying of Pleas by lawyers, explained under the English term CHAMPARTY, to which it is analogous, is prohibited by an old Scots act passed in 1594.

Buys-Ballot, CHRISTOPH HEINRICH DIEDRICH, meteorologist, born at Kloetingen in Zeeland, 10th October 1817, studied at Utrecht, where he became professor of Mathematics (1847) and of Experimental Physics (1870), and in 1854 director of the Royal Meteorological Institute. He was one of the initiators of the system under which, by daily weather reports, and by simultaneous observations at numerous stations by land and by sea, materials are collected for forecasting changes, and his labours contributed materially to the determination of a general law of storms (see STORMS). The inventor of the Aeroklinoscope (q.v.), and of a system of weather signals, he successfully promoted international uniformity in meteorological observations. He died on the 3d February 1890. His works include *Changements périodiques de la Température* (1847); *A Uniform System of Meteorological Observations* (1873).

Buyuk'dereh, on the Bosphorus, 10 miles NNE. of Constantinople, is the summer residence of many of the ambassadors.

Buzau, BUZEU, or BUSEO, the capital of a Rumanian district, 75 miles SW. of Galatz, has petroleum springs; pop. 30,000.

Buzzard (*Buteo*), a genus of birds of prey, in the family Falconidae, having a rather small and weak bill, which bends from the root, and is not notched, as in falcons. The 'cere' is bristly, except

between the nostrils. The portion of the leg just above the foot is not feathered. Buzzards may be regarded as an inferior kind of eagles, which they do not equal in courage or strength. They are large birds, the Common Buzzard

(*B. vulgaris* or *fuscus*) measuring almost 4 feet from tip to tip of its outstretched wings. It is a bird still frequent in Britain, though much less so than it formerly was. It is subject to great variations of plumage; the prevailing colour is brown, with a considerable mixture of black on the upper parts, and of white or grayish



Common Buzzard (*Buteo vulgaris*).

white on the under. It is sluggish and inactive in comparison with many other birds of the same family, and is usually slow in its flight. It often sits long on a tree, watching for prey. When occasion presents it glides silently into the air, and sweeping rapidly down, seizes its victim in its claws. Sometimes, however, it ascends to a great height in the air. This buzzard is plentiful in all the wooded parts of Europe; it is found also in the north of Africa, and is known to exist in the western parts of Asia; but it is doubtful how far it extends over that continent, a distinct although very similar species occurring in the Himalaya Mountains. It is a most useful bird of prey, feeding to a large extent on mice, also on adders and the like. Thirty field-mice have been taken from the crop of a single bird. It is of use too in killing off sickly birds. The nest is built on a tree or rock, or a crow's nest may be utilised. The nest is rough, and composed of sticks and grass. The eggs are three or four in number, and usually bluish white with reddish blotches. Tame female buzzards have been known in several instances to exhibit so strong a propensity for incubation and the rearing of young at the proper season, that they have hatched hens' eggs and brought up the chickens, although if chickens not of their own hatching were brought within their reach, they devoured them. Meat given to the buzzard nurse was carefully divided among her nurslings, but they found out by their own instincts the use of grain and other vegetable food. In Sweden they are often caught for food.—The Rough-legged Buzzard (*Archibuteo lagopus*) is very similar to the former, but is at once distinguished by having the lower portion of the leg feathered to the toes. It is a rarer British bird, yet not of unfrequent occurrence; it is very widely diffused, being found in the Old World from Lapland to the Cape of Good Hope, and equally common in the northern parts of North America. It is very sluggish, and is most frequently to be seen in marshy districts, and often skimming over marshes, where it makes prey of frogs.—The Red-tailed Hawk of North America is a buzzard (*Buteo*—according to some *Falco*—*borealis*), in very bad repute among American farmers and housewives for its frequent invasion of poultry-yards, from which it has acquired the name of *Hen-hawk*.

—Several other species appear to be limited to particular parts of the world, as the handsome *Buteo jackal*—so called from its voice—to South Africa. See also HONEY BUZZARDS, HARRIERS (for the Marsh Harrier or *Moor Buzzard*), and OSPREY for the *Bald Buzzard*.

Byblis, a genus of Lenticulariaceæ (often referred to Droseraceæ), consisting of two tropical Australian species, herbs or undershrubs, which capture insects by means of stalked and sessile glands like those of the Butterwort (q.v.).

Byblos, an ancient city of Phœnicia, now a village called Jubeil, on a shallow bay at the base of the lower range of the Libanus, about half-way between Tripoli and Beyrout. Byblos was famous as the birthplace of Adonis or Tammuz, of whose worship it became the centre; and many devotees were also attracted to the splendid temple of Astarte erected here. The Jews called the town Gebal, and its inhabitants are noticed in the Bible as stone-squarers and calkers of ships. A ruined wall belonging apparently to the era of the Crusades surrounds the town, and Roman and earlier remains are still visible.

Bydgoszcz, the Polish name of Bromberg (q.v.).

Byelaya-Tserskov, a town of Ukraine, 50 miles SSW. of Kiev; pop. 60,000.

Byelgorod. See BELGOROD.

Byelostok. See BIALYSTOK.

Byeltsi, or BALTÍ, a town of Rumania, in Bessarabia, 65 miles NW. of Kishinev; pop. 25,000.

By-laws are rules or regulations made by corporations, railway or other public companies, or local authorities. The term, indeed, is frequently used in a wide sense to designate orders or rules issued by any authority subordinate to parliament. A by-law regularly made by a subordinate authority, in exercise of a power expressly or impliedly conferred, has the force of law within the sphere of its legitimate operation. Thus all regulations made by a corporate body, and intended to bind not only themselves and their officers and servants, but members of the public who come within the sphere of their operations, may be properly called 'by-laws.' The power to make by-laws is usually given in express terms by the charter creating a corporation; and, if such power is not expressly conferred, the corporation nevertheless has an implied power to make by-laws for all purposes within its charter. The power of making by-laws, for definite purposes and within prescribed limits, has been freely conferred by statute on local authorities and public companies. In most cases, however, such by-laws must be confirmed by some central authority. Thus, under the Municipal Corporations Act, 1882, the council of every borough has power 'to make such by-laws as to them seem meet for the good rule and government of the borough, and for the prevention and suppression of nuisances not already punishable in a summary manner by virtue of any act in force throughout the borough.' Such by-laws must be submitted to a Secretary of State, and may be disallowed by order in Council. A county council has the same power to make by-laws within the county as the council of a borough has within the borough; but the by-laws of a county council are not operative in any borough. Additional powers of making by-laws have been conferred on various local authorities by the Public Health Acts, the Education Acts, the Weights and Measures Acts, and other modern statutes. By-laws made by local authorities relating to public health are supervised by the Ministry of Health, which has a series of model by-laws for the guidance of local authorities. Again, all railway companies

and many other public companies—e.g. canal and dock companies—are empowered to issue by-laws for the regulation of their undertakings. Certified copies of the by-laws and regulations made by a railway company must be submitted to the Board of Trade, and may be disallowed by that Board. A by-law, though bearing to be issued under statutory authority, and though sanctioned by the appointed central authority, may nevertheless be invalid, if it goes beyond the powers conferred, or is repugnant to the general law of the land, or is unreasonable in itself. In recent years parliament, to a constantly increasing extent, has by statutes conferred on departments of state and other bodies powers to issue general rules and orders on particular subjects. Thus the Ministry of Health, the Board of Trade, the Board of Agriculture and Fisheries, and other public departments exercise wide delegated powers of legislation, and in many cases the orders and rules issued under these delegated powers are equivalent in force to statutory enactments. Similarly, under the Judicature Act, 1881, a committee of judges has power to make rules regulating the procedure in the High Court of Justice, and the rules so made, which are known as 'Rules of the Supreme Court,' are of great importance, and have all the force and effect of statutes.

In Scotland the powers of corporations to issue by-laws are similar to those obtaining in England, and powers to make rules and regulations have been freely conferred by various statutes on local authorities, public companies, and other bodies on the same general lines as in England.

In the United States the term 'by-laws' is applied to ordinances made by a corporation for its own government. Any such ordinance is invalid if it is contrary to the laws of the state in which the corporation is situated.

Byng, GEORGE, VISCOUNT TORRINGTON, admiral, was born in 1663 at Wrotham, Kent, and entered the navy at the age of fifteen. In 1688 he recommended himself to William of Orange by his activity and zeal in attaching the officers of the fleet to the cause of the Revolution, and was advanced to the rank of captain. Made rear-admiral of the red in 1703, he next year captured Gibraltar, and for his gallant conduct at the sea-fight of Malaga was knighted by Queen Anne. In 1708 he became admiral of the blue, and commanded a squadron fitted out to oppose an intended invasion on the part of the Pretender. He pursued the French fleet to the Firth of Forth, took one ship, and forced the rest back to Dunkirk. For his services during the '15 he was created a baronet; and in 1718 he commanded the English fleet sent to Sicily for the protection of the neutrality of Italy, on 31st July utterly destroying the Spanish fleet off Messina. Soon after, he was appointed treasurer of the navy and rear-admiral of Great Britain. In January 1721 he was sworn of the Privy-council, and in September created Viscount Torrington. On the revival of the Order of the Bath, in 1725, he was installed one of the knights; and, on the accession of George II., became First Lord of the Admiralty. He represented Plymouth in parliament from 1706 until 1721. He died 17th January 1733.

Byng, JOHN, an ill-fated British admiral, fourth son of the preceding, was born in 1704, entered the navy at fourteen, in 1727 was appointed to a frigate, and for the next eight years served mainly in the Mediterranean. Rear-admiral in 1745, he went as second in command to the Mediterranean in 1747, but the death of Vice-admiral Medley soon gave him the chief command, which he retained until the peace. In March 1756 he was promoted to be admiral of the blue, and sent in command

of a poorly equipped squadron to relieve Minorca, blockaded by the French under La Gallissonnière. Byng, on the 20th May, gave the signal to engage the enemy's fleet, almost equal in number of ships and weight to his own. The van under Rear-admiral West at once bore down on the French ships, which stood entirely on the defensive, but the rear, under Byng, got into some disorder and hardly came within gunshot. The van suffered great loss, and Byng, feeling himself unable to renew the action, after a council of war, sailed away to Gibraltar and left Minorca to its fate. When the news reached England the public became furious, and the ministers, to avert the public odium from themselves, ordered the unfortunate Byng to be at once brought home under arrest. He reached the Spithead on the 26th July, and was confined at Greenwich until his trial by court-martial began five months later. He was acquitted of cowardice or disaffection, but was found guilty of neglect of duty in not having done everything in his power to save Minorca, and was condemned to death by the 12th article of war, but recommended to mercy. The king refused to pardon him, and Byng was shot on board the *Monarque* at Portsmouth, 14th March 1757, 'to encourage the others,' in Voltaire's phrase. He met his fate with great courage. See *Papers relating to the Loss of Minorca in 1756*, ed. Richmond (Navy Rec. Soc., vol. xlii. 1913).

Byng of Vimy, JULIAN, first BARON, British general, was born 11th September 1862. Joining the 10th Hussars in 1883, he served in the Sudan, in South Africa, and in Egypt. During the Great War he saw service in France and Gallipoli, becoming lieutenant-general in 1915, when he was also knighted, and general in 1917. He commanded successively the 3d cavalry division (1914), the cavalry corps (1915), the 9th, 17th, and Canadian corps (1916), and the 3d army (1917). Amongst much distinguished service his advance on Cambrai, November 1917, is most noteworthy. Raised to the peerage in 1919, he was appointed Governor-general of Canada in 1921.

Bynkershoek, CORNELIS VAN (1673-1743), a Dutch jurist, who in 1724 became president of the Supreme Court of Holland. He wrote in Latin on Roman law, public law, and Dutch law; his complete works were published at Geneva in 1761, and at London in 1767.

By-products. See WASTE PRODUCTS; also ANILINE, COAL-TAR, PARAFFIN, SODA, SULPHURIC ACID, &c.

Byrd, BIRD, or BIRDE, WILLIAM, the greatest musician of the Tudor school, was born in 1543, probably at Lincoln. He may have studied under Tallis. He became organist of Lincoln in 1563, and, though a recusant, was appointed a gentleman of Queen Elizabeth's Chapel-royal in 1569, sharing with Tallis the honorary post of organist. In 1575 he was granted, along with Tallis, a twenty-one years' monopoly to print and sell music. He died in 1633. Byrd, with his *Psalms, Sonnets, and Songs* (1588), *Songs of Sundry Natures* (1589), *Psalms, Songs, and Sonnets* (1611), was the founder of the English madrigal school. His compositions, also, for the virginal were not to be 'mended by the best Italian of them all.' Byrd's church music, however, represents his finest work. It consists of two books of *Sacrae Cantiones* (1589, 1591), two of *Gradualia* (1607), three masses, and, as with his secular music, many compositions in manuscript. The well-known canon *Non Nobis, Domine*, has been attributed to him. 'Never without reverence to be named of the musicians,' Byrd has been regarded by some as the greatest English composer of all time. His madrigals have been edited by E. H. Fellowes in *The English Madrigal School* (1921,

vols. xiv., xv., xvi.); the Carnegie United Kingdom Trust's edition of Tudor music gives two volumes to his church music; the first appeared in 1922.

Byrd, WILLIAM (1674-1744), an American author, born at Westover, Virginia, studied law in England, took a prominent part in colonial affairs, and became president of the council. His narratives of journeys show wit, urbanity, and a sense of style unusual among Virginians of his time. His *Writings* were edited by J. S. Bassett (1901); his letters were published in 1916.

Byrgius, JUSTUS, or **JOST BÜRGI**, the inventor of various astronomical instruments, was born in 1552, at Lichtensteig, in the Swiss canton of St Gall. In 1579 he entered the service of the learned Landgrave of Hesse, Wilhelm IV., and in 1604 that of the Emperor Rudolf II. His first work was a celestial globe, in which the stars were placed according to his own observations. He died in 1633. Many of his reputed discoveries and inventions are questioned, such as those of logarithms and the proportional compasses. See his *Life* by Gieswald (Danzig, 1856).

Byrlaw (also **BIRLAW** or **BURLAW**), the name given to a sort of popular jurisprudence formerly in use in Scotland, in villages, and among husbandmen. Sir John Skene, writing in 1597, when the system was in full force, defines byrlaw as '*leges rusticorum, de re rustica late*—laws made by husbandmen, concerning neighbourhood to be kept among themselves.'—*Reg. Majest.* lib. iv. As the byrlaw was enacted by the common consent of the villagers or neighbours, so it was administered by judges chosen by them from their own ranks. These judges were commonly called 'byrlaw men,' a name which is still applied in some parts of Scotland to an arbiter, oddsman, or umpire. The courts which they held were called 'byrlaw courts,' and took cognisance of disputes between neighbour and neighbour. Byrlaw seems to be an interesting survival of the system of the ancient Aryan village community, or, at least, an illustration of the principle of visnet, voisinage, or neighbourhood, on which many early institutions were founded. The word is perhaps from Norse *býjar*, gen. of *byr*, 'town.'

Byrom, JOHN, poet and stenographer, was born at Broughton, near Manchester, February 29, 1692. From Merchant Taylors' School he passed to Trinity College, Cambridge, where he took his B.A. in 1712, and two years later was elected to a fellowship. He next travelled, studied medicine at Montpellier, and returned to London to make his bread by teaching a new system of shorthand he had invented at Cambridge. In 1740 he succeeded to the family estates, and in 1742 obtained from parliament the sole privilege for twenty-one years of teaching his system. He maintained friendship and a correspondence with many great contemporaries, and his diary gives us interesting glimpses of Bentley, Bishop Butler, Samuel Clarke, Wesley, and William Law. He died 26th September 1763. The Chetham Society published his diary (2 vols.) in 1854-57; his poems in 1894 *et seq.* His system of shorthand was first published in 1767, at Manchester. It is clear, characterised by 'simple strokes and no arbitrary characters,' but cannot be written with sufficient rapidity, and consequently has long since been superseded by swifter systems. His poems were first collected in 1773. They show dexterity in rhyme and a fine vein of genial satire. Byrom was throughout life a sound Jacobite, and one of his epigrams which reveals this, in spite of its sly safety, has survived:

God bless the King, God bless our faith's defender,
God bless—no harm in blessing—the Pretender;
But who pretender is, and who is king,
God bless us all! that's quite another thing.

Byron, GEORGE GORDON, sixth LORD, was born in Holles Street, Cavendish Square, on the 22d of January 1788. His mother was Catherine Gordon, heiress of the Gordons of Gight; his father was John Byron, nephew of the fifth or 'wicked' Lord Byron, and son of Admiral John Byron (1723-86), who sailed round the world with Anson, or rather who did not sail round, being wrecked in the *Wager*, and subjected to various hardships, of which he wrote a classical account. The admiral was then only a midshipman, and though, in a day when officers were habitually tyrannical, he was mild-mannered as well as gallant, his continual bad luck with the elements made him shunned by sailors much later as 'Foul-weather Jack.' The poet's maternal ancestry hardly belongs directly to this article; it is sufficient to say that it is indissolubly connected with the whole of Scottish history from James I. downward. On the father's side, though there was a blot in the middle of the pedigree (John Byron in the middle of the 16th century being described as *filius naturalis*, and inheriting by deed of gift, not in the ordinary course), the family was hardly less distinguished, and, as far as certain history goes, older. The Buruns, or Byrons, appear immediately after the Conquest as holding lands in most of the northern counties of England, especially Lancashire, Nottingham, and Derby. The chief family estates in the first-named county were acquired by marriage as early as the 12th century; the still more celebrated estate of Newstead was abbey land, and was given to Sir John Byron by Henry VIII. at the dissolution. Although the Byrons appear often in earlier history, it was not till the 17th century that they gained their principal distinction. They were strong royalists, and the Sir John Byron of the day was created Lord Byron of Rochdale, where the Lancashire estates lay, in October 1643, with special reference to services at Newbury. The next noteworthy holder of the title was the already mentioned wicked lord, who, like his brother, was in the navy, who escaped almost by accident the wreck of the ill-fated *Victory* on the Caskets, and who fought under very questionable circumstances, in a private room of a tavern in Pall Mall, a duel with his Nottinghamshire neighbour, Mr Chaworth. Chaworth was killed, and Lord Byron was tried (1765) for murder, but was found guilty only of manslaughter, and escaped with a nominal penalty. He was generally unpopular, and seems to have been decidedly mad; but his madness was very inconvenient for the Byron family, inasmuch as he sold, on a doubtful title, the Lancashire estates, which were much the most profitable part of the property. He did not die till ten years after the poet's birth, and the dilapidation of the property was partly excused by the fact that Captain John Byron, his heir, was at least as great a rascal as himself, without any apparent excuse of madness or ill-luck. This Captain Byron, the poet's father, seduced, borrowed money from, eloped with, married, and ill-treated the Marchioness of Carnarthen; the only offspring of this marriage who lived being Augusta, afterwards Mrs Leigh. Then John Byron, after his first wife's death, married Catherine Gordon, whose fortune he spent, and whom he would probably have ill-treated if she had not been at least as great a vixen as he was a rascal. The memorable picture of Mrs Cadurcis in Lord Beaconsfield's *Venetia* seems to be hardly too harsh for Mrs Byron, who on all occasions seems to have been absolutely incapable of what is commonly called ladylike demeanour. In very early youth the poet (who was born with a club-foot, the source of constant moral torture to him, though it is said that but for his own morbid consciousness it would have passed almost unnoticed) saw something of his father's and mother's quarrels.

His early life was mostly passed at Aberdeen. At Lord Byron's death in 1798 (John Byron had fortunately died seven years before), Mrs Byron and her son removed to England, and in 1801 Byron was sent to Harrow, whence in 1805 he proceeded to Trinity College, Cambridge. He had become at his great-uncle's death a ward of chancery, and Lord Carlisle, a second cousin and an amiable person of some literature, was appointed his guardian. But probably no guardian under heaven could have satisfied Byron's irritable vanity, and the two did not get on well together. The anecdotes of the Harrow and Cambridge career are sufficiently numerous, but there is no room for them here. They are more consonant than usual with the future character of the man, showing a strong individuality, great though as yet unformed and entirely undirected talent, combined with a curious pride of station most unusual in one of such descent on both sides, and rather suggesting the vanity of a parvenu. The most interesting by far of these early incidents is the poet's 'calf-love' (as cruel custom calls it) for Mary Chaworth, heiress of his great-uncle's victim, and a very beautiful girl two years his senior. It is impossible to say how much merely romantic and fanciful sentiment entered into this affection, which as a poet he afterwards commemorated or created in immortal verse. But if it really was love, Miss Chaworth seems not to have returned it, and before Byron went to Cambridge she married John Musters, a mighty hunter of the neighbourhood. The marriage was not happy; but it is doubtful whether she envied Lady Byron. At Cambridge Byron spent the greater part of three years, and made many friends (the most important of whom was the late Lord Broughton), besides keeping a bear, and perpetrating other follies excusable enough. His vacations were spent partly in London, more largely at Southwell, where his mother had taken a house. It was from this time that Byron's habit of accusing himself of all sorts of wickedness in letters began, a habit which has prejudiced against him not merely those who take his letters as true, and are shocked, but also those who know them to be exaggerated, and are disgusted. His first work, *Hours of Idleness*, to which he had privately given circulation under the title of *Juvenilia*, appeared in March 1807. This is probably the worst first book ever written by a considerable poet, and it was savagely 'cut up' in the *Edinburgh Review* exactly a year later. There is no doubt that this attack did Byron good; but his rejoinder was by no means so rapid and careless as he would have liked it to be thought. He took nearly as long to concoct *English Bards and Scotch Reviewers* as his reviewer had taken before the attack appeared; and meanwhile (in the earliest spring of 1809) he came of age, resolved to keep up Newstead (a very difficult thing with his dilapidated fortune, even if he had been a more careful man), and took his seat in the House of Lords. He published *English Bards*, an imitative but, in its way, capital Popian satire, and soon afterwards (in June 1809) started for a grand tour, which, owing to the continental war, had to be of a somewhat different character from the regular grand tour of the preceding century.

He first sailed from Falmouth to Lisbon, and then after brief visits to Spain and Malta, made his way to Greece, where (in the large sense of the Greek countries round the *Ægean*) he spent the greater part of two years. There is no doubt that this visit 'made' Byron. His powerful and original faculties were associated with a strange bent towards the conventional and the commonplace, and it required something absolutely new, something of which the average Englishmen knew nothing, to awake his spirit. At this time the remoter parts of Europe

were much less familiar to Englishmen than the Niger or the Rio Negro are now, and the medicine exactly suited the patient. Almost immediately after his return, and before he had time to reach her deathbed, his mother died, and his most intimate friend Matthews was drowned at Cambridge within a week. It will always be one of the capital anecdotes illustrating the insensibility of authors to their own strength and weakness, that Byron, whose *English Bards* had been very successful, intended to bring out on his return certain *Hints from Horace*, which are only a little better than the *Hours of Idleness*; and when asked by his friend Dallas if he had nothing else, produced, as a 'lot of Spenserian stanzas' not worth troubling anybody with, the first two cantos of *Childe Harold*. Gifford and Murray, to whom Dallas showed these, at once saw their merit, but the poem was not issued rapidly; indeed, Byron was by no means the rapid writer or issuer that he would have seemed. He had much disagreeable business, for, as has been mentioned, his affairs were wretchedly involved, by no means owing to his own fault wholly. He renewed acquaintance and began affection with his sister Augusta, spoke sometimes in the House of Lords, and went much into society; but neither now nor at any time did he like England, where the life was too uniform to suit him, and where he was not nearly monarch enough of all he surveyed to please him. Even he, however, can hardly have been disappointed at the success of *Childe Harold*, which, appearing on the 20th of February 1812, had, before the end of March, run through seven whole editions. Byron's admirers had now no cause of complaint as to his slowness in publication. Besides smaller pieces, the *Giaour* and the *Bride of Abydos* appeared in the same year (1813), the *Corsair*, *Lara*, and the *Hebrew Melodies* in 1814, the *Bride of Corinth* and *Parisina* in 1815. He said he wrote the *Corsair* (of which the public bought 14,000 copies in a day) in ten days, and the *Bride of Abydos* in four; but remarks of Byron's of this kind are not to be taken too literally. During these years he was the darling of society, knew almost every one in London who was worth knowing, and was the object of the maddest devotion from many women, notably Lady Caroline Lamb. On 2d January 1815, to the surprise of all and the consternation of a few, he married Anne Isabella Milbanke, heiress in her own right of the barony of Wentworth and of a considerable fortune. His daughter Ada was born in December 1815, and in January 1816 Lady Byron left her husband's house for ever.

Hardly any recent event, not concerning politics or religion, has ever exercised pens and tongues like this. Neither party immediately concerned ever gave to the world an authoritative version of the circumstances which led to it, and though there are many contradictory assertions on the subject, it is doubtful whether there is even in unpublished documents any quite satisfactory evidence. Forty-five years after the poet's death, Mrs Beecher Stowe informed the world that Lady Byron (then dead) had informed her that the separation was due to her discovery of a more than sisterly affection between the poet and his sister Augusta. But proof on three points—that Lady Byron told Mrs Stowe this; that Lady Byron, if she told Mrs Stowe so, believed it; and most important of all, that Lady Byron, if she believed it, had any ground for believing—is wholly wanting; and the relations between Lady Byron and Mrs Leigh subsequent to the separation are hopelessly incompatible with the story. Among those who have dealt specifically with these subjects are Mr Jeaffreson, Lord Lovelace, and Mr Edgecumbe; for their contributions see the paragraph at the end of this article. The

judgment of the wisest as to the separation itself has never varied much—That nothing further need be sought than the natural incompatibility of a spoiled dandy and author of loose habits, violent temper, and pecuniary circumstances likely to produce perpetual irritation, and a spoiled heiress of exceptionally cold temperament, and of orthodox and even prim manners and notions. The blame was in all probability equally divided, but it was not equally apportioned; and Byron, after being a popular favourite for three years, was held up to such obloquy in newspapers and by society, that he left England and never returned.

He first went up the Rhine to Switzerland, where he met the Shelleys, with whom he connected himself by friendship with the poet, and more questionably by a liaison with Jane or Claire Clairmont, daughter of the second Mrs Shelley's stepmother by her first husband. He went on in a leisurely manner to Venice, which he reached at the end of the year, and which was his headquarters for some two years. His life at this time and place has been represented as one of wild debauchery, principally on the always untrustworthy evidence of his own assertions and hints. It is certain, however, that at the end of 1818 he entered upon a comparatively regular existence by becoming the accepted lover in Italian fashion of the Countess Teresa Guiccioli. During 1819 and 1820 he was living for the most part in her society at Ravenna. In the summer of the latter year he removed to Pisa; in 1822 he was present at Shelley's funeral, and engaged (an engagement which showed neither to advantage) with Leigh Hunt in the *Liberal*. From Pisa a further move was made in 1822 to Genoa. It was here, in 1823, that he received the proposals which enabled him to crown his life with a death not unheroic. He had always been a nominal, though a very unclassified, Liberal, and had latterly engaged in some Carbonari plots in Italy. He was now applied to through his friends Kinnaird and Hobhouse to join the movement for recovering the independence of Greece, and he set out for Greece itself on the 14th July 1823. But many weary months, spent chiefly in the Ionian Islands, passed before he could get into active work; nor was the delay in any way his fault. At last he landed at Missolonghi on the 5th January 1824; laboured with more difficult, if less showy, heroism than if he had been storming Turkish castles, against bad weather, disunion among the Greeks, lack of material, and all tiresome checks; caught rheumatic fever, and died on the 19th April. His body was brought to England, and buried in the church of Hucknall-Torkard, near Newstead. His literary activity since he left England had been very great. The stimulus of his wife's desertion produced almost immediately two short poems, *The Dream* and *Darkness*, which were, perhaps, his poetical high-water mark. In the course of the seven years he completed *Childe Harold*, wrote a series of dramas or dramatic poems (*Manfred*, *Cain*, *Marino Faliero*, *Sardanapalus*, and others), which contain much of his most characteristic work; and produced, besides the wonderful bravura of *Mazeppa*, the cleverness of *Beppo*, and other things, the vast satiric medley of *Don Juan*.

The character of Byron, his genius, and the history of his literary reputation, are all subjects of great interest. In his own day, and immediately afterwards, his 'morality,' in the limited sense in which that word is popularly used, was the principal subject of discussion, and was most harshly judged. Recently it has been admitted: (1) That his education and circumstances supply a large palliation for faults of this kind; (2) that his own habit of fanfaronade exaggerated his moral delinquencies; and (3) that all faults of such

a kind (for Byron, though a libertine, is never accused of treachery or cruelty in his libertinism) concern posterity but little. If, however, this side of his character has been more leniently judged, another side has been judged with increasing unfriendliness, and the poet's pride and vanity of birth (displayed in a manner to which the term 'snobbishness' is almost applicable), his alternations of ostentatious prodigality and sharp business practice, his childish vanity of all kinds, have received perhaps not undue, but certainly severe treatment.

In regard to his literary genius, English critical opinion steadily sank from the date of his death, and though efforts have from time to time been made to set him on a higher position, the attempt has not as yet received either critical or popular approval. Every competent critic admits Byron's power. At his best he could utter what he himself had actually seen and felt with an energy not surpassed by any writer of any period in any language. For passion of a certain kind, and for picturesqueness of a certain kind, he is almost unequalled. But this merit of personal utterance involves almost of necessity two defects—complete failure when he endeavoured to portray anything besides his own personal emotions and experiences, and not infrequent insincerity and theatricality when, in default of actual emotion and experience, he endeavoured to simulate such experience and emotion. For he was not a man of many-sided mind or even feeling. The monotony of the Byronic hero—the man of dark imaginings, universal disillusion, and general contempt of man—but especially of woman-kind—is freely granted; yet the poet can write of little or nothing else, and as soon as the type ceases to be impressive it becomes ridiculous. A second great objection to Byron is his extraordinary weakness as regards all the formal merits of poetry. Hardly a long passage, certainly no long poem, of his can be cited which, after brilliant images, forcible expressions, and melodious verse, does not break down into the most commonplace thought and phrase, the most inharmonious rhythm, even into sheer bellman's rhyme and kitchenmaid's grammar. Accordingly his most uniform strength is to be found in his satirical work, which of its nature suffers less from these defects than serious or romantic verse. Byron had no humour; but he had a most keen, abounding, and versatile wit of a somewhat Voltairian character, but richer and more poetical than Voltaire's in quality, so that *Don Juan* ranks far above the *Pucelle*. He attempted no serious prose; but his letters, though somewhat artificial, are of singular excellence; indeed they are perhaps of their kind the best in English.

His poetical influence in his own country for a time swept all before it, but is now almost nonexistent. Abroad, on the contrary, it long maintained itself or even increased, and the dictum attributed to Mazzini, that Byron 'made English literature European,' received confirmation. Few foreigners are in a position to seize the subtle formal defects, which, for all but the most uncritical English readers, mar every page of Byron's work. All are able to appreciate the strong points noted above, points in which, as has been said, Byron has few, if any, rivals in his strength. Some at least of his weaknesses even appealed to Continental opinion. His irreverence, his contempt for propriety, his open-mouthed egotism, his language about women, his theatricality, never shocked Frenchmen, Italians, and Germans as they—formerly, at least—shocked his own countrymen. Political causes assisting, and a considerable literary movement breaking out in all European countries at the beginning of the second quarter of the century, Byron attained the surest of all positions

of influence, that of influencing those who influence their own countrymen. Hugo, Delavigne, De Musset, De Vigny, Flaubert, and the whole Romantic school in France, Lenau and Heine to a certain extent in Germany, Pushkin and Lermontoff in Russia, Espronceda in Spain, Byronised *ad libitum*; while the poet was a main inspiration to many Italian writers, and shared with the classics the credit of producing Leopardi. Perhaps also Byron's ostentatious affectation of being un-English helped to create and preserve his popularity with the world from which Englishmen are still so sharply divided.

The history of Byron's Life by Moore (2 vols. 1830) is curious. Byron gave his own Memoirs to Moore, and that poet sold them in 1821 to Mr Murray for £2000. Objections on the part of Lady Byron and others were raised to their publication, and in 1824 the manuscript was burned, Moore refunding the purchase-money, but receiving a still larger sum for the Life, in which such of the matter of the Memoirs as was deemed prudent was worked up with letters and personal reminiscences. According to Lord Broughton, all Byron's friends, except perhaps Moore, thought the Memoirs should be burnt, for the sake of Byron's reputation. As to the separation, Mr J. C. Jeaffreson in *The Real Lord Byron* (1883) failed to solve the mystery or contribute any information of real value. Between 1905 and 1910 the matter was revived again by Lord Lovelace, Mr Richard Edgcumbe, and others in the books and articles cited below. The first-named, in his *Astarte*, supported the Stowe charge; Mr Edgcumbe, while denying this, imported new scandal into the affair concerning Byron's relations with his early love, Mary Chaworth, as Mrs Musters; while the belated publication of Lord Broughton's (Byron's friend Hobhouse's) *Recollections of a Long Life* (4 vols. 1909-10) rather restated than reinforced the defence for Byron. It need only be added that the new charge against Mrs Musters rests upon no direct testimony whatever as yet produced, and that there is still none as to the other one against Mrs Leigh. Of books on Byron may be named, besides those above mentioned, the short Life by Professor Nichol (in the 'English Men of Letters' series, 1883); also works by Lady Blessington (1834), Medwin (1824), the Countess Guiccioli (1868), and Miss E. C. Mayne (1912). Lord Broughton's *Recollections* abound in intimate references to the poet and his affairs. The editions of Byron's works are innumerable, but all those which have any authority have proceeded from the publishing house of Murray. The final edition of his *Works, Letters, and Journals* by Rowland E. Prothero (Lord Erle) and Ernest Hartley Coleridge was published in 13 vols. in 1898-1904. His *Correspondence* was edited by John Murray (1922). For Byron in Germany see Oechsenbein (1905), and for Byron and French Romanticism, Estève (1907). Brandes in *The Main Currents of Nineteenth Century Literature* (vol. iv. 1905) gives what must be pronounced an extravagant eulogy of Byron. The German translation of 1828 in 31 vols. was by thirteen different authors; an independent one was issued in 1830-31. *Childe Harold* appeared in Armenian, Hungarian, Bohemian, Danish, and Swedish versions; was twice translated into Russian, five times into Polish, eight times into Italian, at least eight times into French, and eleven times into German. Somewhat similar was the case with *Don Juan, Manfred*, and the other important works of the poet. Only two children of Byron are known. Allegra (1817-22), his illegitimate daughter by Claire Clairmont, died before him, to his great grief. His daughter Ada (1815-52) married in 1835 Lord Lovelace, and left two children, Lord Lovelace and Lady Anne Blunt (Baroness Wentworth).

Byron, HENRY JAMES, dramatist, born in Manchester, January 1834, entered the Middle Temple in 1858, and was for many years a prolific and popular writer of burlesques and extravaganzas. He wrote extensively for periodicals, was the first editor of *Fun*, and leased several theatres, where he produced more ambitious plays, in which he himself occasionally appeared. These were less comedies than domestic dramas, enlivened by the smart dialogue and brisk incidents of farce. The best was *Cyril's Success* (1868); the most successful,

Our Boys, which had an unprecedented run in London from 16th January 1875 to 18th April 1879. Byron died in London, 11th April 1884. He excelled in depicting Cockney vulgarity, and his dialogue is clever and amusing, but overlaid with repartee and puns, for which he readily sacrificed probability. His plots are original and ingenious, and are always healthy and full of human interest.

Bysshe, EDWARD, lived in London as a literary hack in the beginning of the eighteenth century. His *Art of English Poetry* (1702) is notable as containing, in addition to a rhyming dictionary and a collection of allusions, similes, descriptions, &c. from the English poets, a set of 'dogmatic rules for making verses,' which attained immediate recognition as an authoritative statement of the neoclassic creed. He edited Sir Richard Bulstrode's *Letters* (1712), and translated Xenophon (1712).

Byssus, an old name for silk-like threads secreted by the 'foot' of many bivalve molluscs. The secretion, from a gland opening in a median posterior furrow, is at first fluid, but soon hardens into silky threads. The process may be readily watched in an aquarium. Its occurrence in the common mussel is very familiar. There, as in most other cases, the tufts of spreading threads



Byssus of Common Mussel.

serve to anchor the mollusc temporarily or permanently to its base of attachment. In other cases, however, it may be employed in binding together a rude nest (*Crenella discors*, *Modiola vestita*, *Lima hians*). In young forms also, as in the common fresh-water mussel, a byssus gland may be present weaving silken threads of attachment, but this does not appear to be exactly comparable to the adult organ. The silk of the very large *Pinna nobilis* is finer and more abundant than that of any other mollusc. It has been woven into small articles of dress, in early times for royal personages, in later for lovers of curiosities, especially at Taranto, Reggio, and Cagliari in Italy. See BIVALVES, MOLLUSCA, MUSSEL, PINNA.

Byström, JOHANN NIKOLAS, a Swedish sculptor, was born in 1783, lived much in Italy, and died at Rome, 13th March 1848.

Bytown, till 1854 the name of Ottawa (q.v.).

Bytownite, a Felspar (q.v.) between anorthite and labradorite.

Bywater, INGRAM (1840-1914), a consummate Greek scholar, born in London, studied at University and King's College schools, and Queen's College, Oxford, and was in 1893-1908 regius professor of Greek at Oxford. He edited the *Ethics* and *Poetics* of Aristotle, and other philosophical works. See Life by W. W. Jackson (1917).

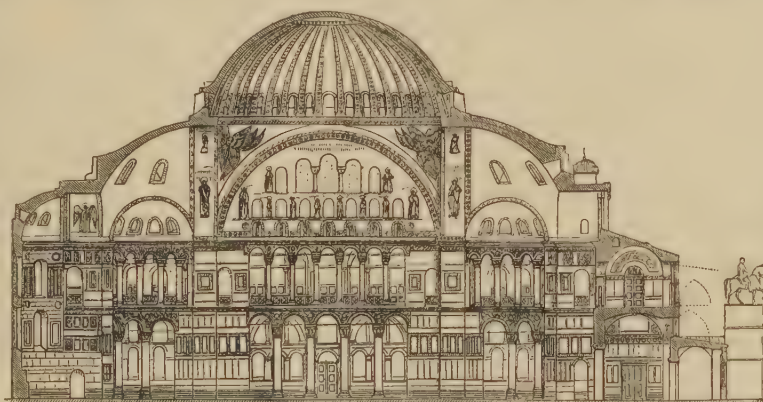
Byzantine Architecture is the style practised in Byzantium and the Eastern empire from the time when Constantine made Byzantium, thenceforth Constantinople, his capital, till its capture by the Turks in 1453. It belongs to the Christian art of Hellenic and Oriental peoples from

the time that it began to differ markedly from early Christian art, which originally both east and west had largely in common. This style of architecture, whose traditions are still preserved in the buildings of the Eastern Church, branches out of the classic styles of Greece and Rome. Owing to the long continuance at Byzantium, under its new name of Constantinople, of part at least of the power and sovereignty of the Roman empire, and to the comparative exemption of the eastern capital from the invasions of the barbarians who overran and destroyed the monuments of the West, the transition from the classic forms of construction and design can be more clearly traced in the former than in the latter. When Constantine, in the beginning of the 4th century, removed the seat of the imperial court and government from Rome to Byzantium, he created in his new capital a fine field for the practice of the arts, and especially of architecture. Many new and splendid edifices were required, and every encouragement was given to those familiar with the constructive and decorative arts to come to Byzantium, and lend their aid in making the new city more splendid even than the old capital.

At this time Roman art was in its decadence. The classic forms and ornaments were debased and decrepit, and new features derived from the constructional elements of Roman building were beginning to supersede them. Thus, in the palace of Diocletian at Spalato, the horizontal classic entablature began to be carried round the arches, and the latter to spring directly from the capitals of the columns. In its transference to Constantinople this decaying Roman art came into contact with new elements, which inspired it with fresh life. The Romans were distinguished as constructors, and had elaborated the scientific use of the arch and vault on a great scale in their large edifices. These vaults were of several different kinds, comprising both the dome and the intersecting barrel vault. It is remarkable how the adoption of these forms of vaulting, the first by the Eastern and the last by the Western peoples, led to the development of the two great styles of the middle ages—the Byzantine and the Gothic. It seems certain that the Sassanians in Persia had practised the use of the dome for a considerable time, and it is probable that their vicinity to the meeting-point of East and West at Constantinople may have had an important influence in determining the final adoption and development of the domical form as the leading feature of Byzantine architecture. The same influence no doubt tended greatly to modify the classic details into those characteristic of the Byzantine style. The former being debased and worn out, the new ideas derived from the East were gladly seized upon, and in their turn inspired the artists with fresh vigour. The Greek element in the population also no doubt contributed to produce a strong influence on the taste and refinement displayed in this style.

The churches built by Constantine seem to have been on the same plans as those of Italy—viz. either round or basilican in form. Of these two

forms examples exist (although rebuilt) at Jerusalem and Bethlehem, and in both the ancient classic entablature and details are retained, while the arches spring from the capitals. By the time of Justinian, in the 6th century, the new style had been formed and fully developed in its main features. As above mentioned, the dome constituted the ruling element in the construction. The difficulty with this form was so to enlarge it as to give sufficient space for a great church. At first an aisle was placed round the central part (immediately under the dome), the latter being supported on eight pillars or piers. But these encumbered the floor and impeded the view, and after a time this inconvenience was obviated by the discovery that the dome might be supported on four pillars by corbelling out the angles between the circle and the square. This important invention enabled the design to be extended indefinitely by a number of domes, just as is the case with the groined arches of the West. The grandest example of this design is the church of St Sophia at Constantinople, built under Justinian, in the first half of the 6th century. There the interior is composed of a great central dome, 107 feet in diameter and 182 feet in height, carried on four piers, and length is given to the church by the addition of a semi-dome at either end. These also serve to sustain the pressure of the upper dome. The lower part of the building is



Section of St Sophia, Constantinople.

divided up with small pillars and arches, which have the effect of enhancing the size and grandeur of the simple dome. The latter is pierced with a row of windows round its base. This feature became afterwards a constant one in Byzantine churches. Externally the sloping apertures looked awkward, and a series of upright arches was substituted, with a dome resting above them. This being a weak form of construction, it tended to limit the size of the domes used in later examples. One striking characteristic of the Byzantine style is the extensive use of coloured decoration. This is a notable feature in St Sophia, where the pillars are formed of and the walls are lined with the richest marbles, while the domes are adorned with splendid mosaics.

Byzantine ornament differs considerably from the classic as well as the Gothic of the West, being always flat and incised, while the latter is bold, and apparently applied to or projected from the structural form, as, for instance, in the cusp. A curious reminiscence of the classic entablature is preserved in the block which usually intervenes in Byzantine architecture between the capital of the

columns and the arch. The Byzantines were distinguished during the middle ages for all kinds of carving and metal-work, and there can be no doubt that these works of art had a great influence in the



Byzantine Capital from the nave of St Demetrius, Thessalonica.

12th century on the nascent art of the West. The church of St Mark at Venice is by far the most notable of the Byzantine style in the West. It was copied soon after its erection in the 11th century at Périgueux, in Aquitaine, and this led to the extensive use of the dome in that part of France. The Roman Catholic Cathedral of Westminster, consecrated in 1910, is the most outstanding recent example of Byzantine

architecture in the West. See Sir T. G. Jackson's *Byzantine and Romanesque Architecture* (1913).

Byzantine Art in general, developed at Constantinople under the same influences as Byzantine architecture, was mainly used for the decoration of churches. From the 6th century onwards for several centuries the most interesting remains of pictorial art were mosaics in the churches and miniature illustrations of Bibles and religious books. The Byzantine school, both in mosaic and painting, is characterised by a hierarchical stiffness in representing the human figure, by length and meagreness of limbs, features almost blank in expression, long, narrow eyes, and conventional attitudes. The colours, bright but crude, were often laid on a gold background. Yet even this type is superior in dignity and strength to the earliest Christian style of art, based on a degraded Roman pattern. The Byzantine style changed or developed very little for centuries, so that it is difficult to discover the date of a picture by internal evidence. It prevailed universally in Italy and other parts of Europe till the end of the 13th century, when Giotto (q.v.) broke from the Byzantine model which Cimabue (q.v.) still followed, and thus began the great renaissance of painting. The Byzantine method is still largely practised for religious subjects in Russia, Greece, and other countries belonging to the Greek Church. See ART, MOSAIC, PAINTING, RENAISSANCE.

Byzantine Empire, also styled the EAST ROMAN, EASTERN, GREEK, or LOWER EMPIRE, was founded in 395 A.D., when Theodosius the Great, at his death, divided the Roman empire between his two sons, Arcadius and Honorius. The empire had previously for a time been divided into East and West, but the division then made by Theodosius was final. Arcadius, a weak and luxurious character, was made emperor of the eastern division, formerly included under the prefectures of the East and part of Illyricum—namely, Syria, Asia Minor, and Pontus, stretching along the shores of the Black Sea in Asia; Egypt in Africa; and Thrace, Mœsia (now Bulgaria), Macedonia, Greece, and Crete in Europe. The empire thus formed lasted more than a thousand years, and underwent a great variety of fortune. It took the name of Byzantine empire from Byzantium, the ancient name of its capital, which after 330 was usually called Constantinople or New Rome.

(1) *Period of Greek Revival* (395–716), marked by the victories of Justinian and Heraclius.—Arcadius left the government of the empire in the hands of his minister Rufinus, from whom it passed to the eunuch Eutropius, and afterwards to Gainas, the murderer of Rufinus. Gainas fell by his ambition in 401, and the shameless and avaricious Empress Eudoxia ruled until the time of her death in 404 (see ARCADIUS). Arcadius was succeeded by his son, Theodosius II. (408–450), a feeble prince. During his reign affairs were ably and successfully conducted by his sister, Pulcheria. Yet Thrace and Macedonia could only be secured from the destructive conquests of Attila by the payment of tribute. After the death of Theodosius II., Pulcheria married the senator Marcianus (450–457), whose firmness repelled the invasions of Attila. Marcianus was followed by Leo I., surnamed Macella (the Butcher), a Thracian of low birth, but elevated to the throne by the commander-in-chief, Aspar, who, being himself an Arian, would not venture to encounter the perils that sovereignty might have entailed on one of his religious views. Leo II., grandson of the former, succeeded, but died after a few months, in consequence of which the crown came into the possession of his father, Zeno (474–491), who was banished by Basiliscus (475), but who reascended the throne in 477. Though a weak and unpopular ruler, he contrived to retain his power in spite of several serious revolts. The internal distraction of the empire, to which, as at other times, religious strifes added considerably, increased greatly during the reign of Zeno, and the invasions of the Goths were prevented only by gifts and stratagems. Ariadne, widow of Zeno, married the courtier Silentiarius, and raised him to the throne under the title of Anastasius I. (491–518). By the help of the Goths, this monarch overthrew the robber tribes of Mount Taurus. A new enemy, however, now appeared on the Danube in the Bulgarians, against whose desolating raids Anastasius built the Long Wall, to protect the peninsula on which Constantinople is situated. The war with the Persians also broke out anew during his reign, and religious tumults often purpled the streets of Constantinople itself. After his death, the army raised Justinus I. to the throne. He maintained his position mainly through the favour of the clergy, whom he had conciliated by his severe persecution of heretics.

His nephew, Justinian (q.v.), succeeded (527–565). He was celebrated for his code of laws, and for the victories of his great generals, Belisarius (q.v.) and Narses (q.v.), which re-established the empire both in Africa and Italy. But the rapid decline of the empire after his death showed that he had not been able to give it any internal consolidation or vitality. It was during the reign of Justinian that those pestilent contests of the Blues and Whites against the Greens and Reds (political factions so named from the colours respectively worn) first attained any consequence; and though the first disturbance was terribly chastised by Belisarius in 532, they continued to distract the capital periodically down to the 7th century. Justin II. (565–578), a weak man, governed by his wife, Sophia, yielded a part of Italy to the Longobards, was unsuccessful against the Persians, allowed the Avars to plunder the Danubian provinces, and ultimately became insane through vexation and anxiety. Tiberius, the captain of the guard, was then made regent, and after the death of Justin II., received the imperial dignity. He ruled with mildness and prudence (578–582), purchased a peace with the Avars, concluded the war with Persia, and left as his successor the commander-in-chief, Maurice, who reigned from 582 to 602. Having replaced on the throne the Persian

king, Chosroes II., who had been banished by his subjects, he thus secured the peace of his eastern frontiers; but the war against the Avars did not prosper. His niggardly treatment of the army caused a military insurrection, in which he was slain along with his son; and Phocas, one of his generals, was elevated to the throne. Phocas proved a bad ruler. Through his monstrous vices, tyranny, and incapacity for government, the empire lapsed into still deeper anarchy. Suddenly, however, a deliverer appeared in the person of Heraclius (q.v.), son of the exarch or governor-general of Africa, who overthrew the tyrant, and ascended the throne in 610. But great as was the genius of Heraclius, he had to submit to twelve years of defeat before he could organise and discipline a victorious army. In 622 he opened those magnificent campaigns in which the power of Persia was crushed, and which, in the opinion of Gibbon, were equal to those of Scipio or Hannibal. He lived, however, to see more formidable foes in the Saracens, who, during 632-641, overran the countries on the Euphrates, with Syria, Judæa, and Egypt. The power of the Greeks, which was demanded to resist the Arabian invasions, was miserably divided and weakened by their unending religious quarrels, especially the controversy of the Orthodox against the Monothelites (q.v.). The empire was breaking asunder, and Heraclius, worn out with the fatigues of war, had abandoned his enfeebled senses to pleasure, and his enfeebled intellect to theological discussions. He died in 641. Constantine III., who succeeded his father, Heraclius, also died soon after, and was followed for a short time by Heraclonas. The next ruler was Constans, son of Constantine III., who ruled from 642 to 668, made himself odious by cruelty, and perished in an insurrection. His son, Constantine IV., Pogonatus (668-685), repelled a seven years' siege (672-679) of the Saracens, chiefly by means of the Greek fire. On the other hand, he was compelled to pay tribute to the Bulgarians, who had established themselves in ancient Mœsia. Justinian II. (685-711), son and successor of Pogonatus, had a most troubled reign. At this period the empire had sunk to a very low condition, having lost most of its possessions both in Asia and Europe, while anarchy and rebellion prevailed at home. Six emperors were dethroned in twenty-one years. It was saved from ruin by the talent and energy of Leo III., the Isaurian, general of the army of the East, who in 716 seized the throne.

(2) *Period of Comparative Prosperity (716-1057)*, marked by successful defence against Saracens and Bulgarians.—Leo reorganised the army and the financial system, and in 718 repelled a formidable attack of the Saracens, but in 726 unfortunately began the controversy about image-worship, which rent the empire for more than a century. In 728 the exarchate of Ravenna was lost, and the eastern provinces became the prey of the Saracens, over whom, however, he won a great victory in Phrygia. He died in 741. Constantine V. (741-775), son of Leo III., was on account of his zeal as an iconoclast hated by the monks, who gave him the surname 'Copronymos,' because, as they said, he had polluted the font at his baptism. He was a brave ruler, recovered from the Saracens parts of Syria and Armenia, and ultimately defeated the Bulgarians, against whom he had long been unsuccessful. His son, Leo IV. (775-780), was a mild ruler; but by the ability of his generals, he made the boundaries of the empire secure against the Saracens. After him, Constantine VI. ascended the throne under the guardianship of his ambitious mother, Irene (q.v.), who raised a powerful party in favour of image-worship. Constantine having

made an attempt to liberate himself from the influence of his mother and her paramour, Stauratius, Irene barbarously caused her own son to be blinded (797). He died soon after this atrocity; and Irene, who had boldly conceived the design of marrying the Emperor Charlemagne, and thus uniting the east and west of Europe in one vast realm, excited the opposition which in 802 placed her treasurer, Nicephorus, on the throne. The restoration of the western empire by Charlemagne in 800 completed the division of the old Roman empire into East and West. Nicephorus, who fell in battle against the Bulgarians (811), was succeeded by his son, Stauratius, who soon yielded the throne to his brother-in-law, Michael I., from whom it was taken by the Armenian general, Leo V., a powerful ruler, who conquered the Bulgarians, but fell (820) in a conspiracy excited by his zeal against image-worship. Michael II., the Stammerer, was raised from a dungeon to the throne, and ruled until 829. In his reign, Crete and Sicily passed into the hands of the Saracens. Under the rule of his son, Theophilus, who is praised by the Byzantine historians for his love of justice (829-842), the general, Manuel, gained some indecisive victories over the Saracens. Theodora, widow of Theophilus, and guardian of Michael III. (842-867), brought the controversy about image-worship to a close at the council of Nicea, or Nice, in 842, when it was fully sanctioned and restored. During this reign the government busied itself in the persecution of the Paulicians (q.v.), while the Saracens devastated the Asiatic provinces.

Theodora having been banished to a convent by her son, the government was for some time held by Bardas, uncle of Michael III., and after his assassination, by Basilus I., the Macedonian, who caused Michael to be put to death, and afterwards ruled ably from 867 to 886. But though on the whole he was successful against the Saracens, the latter contrived to make themselves masters of Syracuse. His dynasty (the Macedonian) maintained itself on the Byzantine throne, with some few interruptions, until 1056. The reign of his son, Leo VI., the Philosopher (886-912), was not prosperous. The inroads of the Bulgarians and of the Saracens, who in 904 plundered Thessalonica, continued to increase during the government of his son, Constantine VII., Porphyrogenitus, who ruled mildly but feebly (912-959). Under his son, the dissolute Romanus II. (959-963), Crete was retaken from the Saracens by the vigour of his general, Nicephorus Phocas, who, on the death of the emperor, married his widow, Theophania. She, however, caused him to be murdered in 969, as she wished to marry John Zimisces, who ruled till 976, and, like his predecessor, was victorious against the Saracens and Bulgarians, as also the Russians, who for a considerable period annoyed the empire with their attacks. His successor, Basilus II. (976-1025), the son of Romanus, conquered the Bulgarian kingdom, and attached it as a province to the empire, which it remained till 1186, when it again became independent. His brother, Constantine VIII. (1025-28), did not resemble him. Romanus III. next ascended the throne, but was assassinated by his wife, Zoe, a profligate but crafty princess, who raised successively to the imperial dignity Michael IV. (1034), Michael V. (1041), and Constantine IX. (1042). After Constantine's death in 1054, Theodora, sister of Zoe, was elected empress; and on her death in 1056, Michael VI., who was deposed by Isaac I., Comnenus. At the beginning of the 11th century the Saracen power, which had so long been a dangerous rival of the Byzantine empire, broke down, but the Seljuk Turks, a yet more formidable enemy, appeared on the eastern frontier.

In Lower Italy, the Normans narrowed the Byzantine power to the possession of Otranto.

(3) *Period of Decline* (1057-1204), marked by the Crusades and the advance of the Turkish power in Asia.—With Isaac I., Comnenus, who came to the throne in 1057, the dynasty of the Comnenian emperors began. He retired to a monastery (1059), and was succeeded by Constantine X., whose widow, Eudocia, married Romanus IV., and raised him to the throne. Romanus was deposed in 1071 by Michael VII. (son of Constantine X.), who, in his turn, was dethroned by Nicephorus III. (1078), who reigned until 1081, when he was deposed by Alexius I. (q.v.), Comnenus (1081-1118). This last reign was marked by the commencement of the Crusades, during which the Byzantine emperors had a most difficult part to play. The Crusades, however, helped greatly to check the advance of the Seljuk Turks, whose dominion had already extended itself to the Hellespont. The successors of Alexius—his son, Kalo-Joannes (1118-43), and Manuel I. (1143-80)—were able rulers, and victorious in their engagements with the Turks. Manuel's son, Alexius II., was murdered by his guardian, Andronicus (grandson of Alexius I.), who raised himself to the throne. He was the last prince of the Comnenian dynasty, and fell in an insurrection excited by his own cruelty (1185). A period of confusion ensued, during which an Isaac II., and three emperors of the name of Alexius, followed each other in quick succession till 1204.

(4) *Latin Occupation* (1204-61).—In 1204 the French and the Venetians (collectively named *Latins*) advanced on Constantinople, and captured the city. The European portion of the empire was divided into four parts, of which the first, including the metropolis, fell to the lot of Baldwin, Count of Flanders, who was made emperor, and to whom the other participants in the expedition did fealty for their respective shares. In the west of Asia Minor, Theodorus Lascaris, who had been elected emperor at Constantinople, formally transferred the seat of government to Nicæa; in the north-east of Asia Minor, the governor of the province of Colchis, Alexius Comnenus, ultimately ruled at Trebizond with absolute authority; while one of his successors, John Comnenus, even assumed the title of emperor. The Latin occupation was an event alike disgraceful to the leaders who effected it and permanently hurtful to the Byzantine empire, which never recovered its lost cohesion. At Constantinople neither Baldwin nor his successors could strengthen the sinking empire. Baldwin himself died a prisoner in the hands of the Bulgarians. After him came his brother Henry, who ruled bravely and wisely till 1216. For the next four years the empire was actually without a ruler, and a prey to utter anarchy. In 1221 Robert, son of Peter, Count of Auxerre and Courtenay, came to the throne; he was succeeded by John of Brienne, titular king of Jerusalem (1228-37), and the latter by Baldwin II. (1237-61). During these reigns a great part of the empire was seized by John Vatatzes, successor of Theodorus Lascaris of Nicæa (1222-55). This ruler was followed in Nicæa by Theodorus II. (1255-59), whose son, Johannes, during his minority, was superseded by Michael VIII., Palæologus, who, by the help of the Genoese, captured Constantinople in 1261, and thus put an end to the Latin dynasty.

(5) *Period of Fall* (1261-1453), marked from 1354 by the rapid advance of the Turks in Europe. Michael, the first of the Palæologi, a powerful prince, really endeavoured to strengthen the realm; but by his unhappy attempt to unite the Greek Church with the Latin, from which it had decisively separated (1054), he gave great offence

to the clergy and the people. His son, Andronicus II., who came to the throne in 1282, re-established the Greek ritual. After the death of his son and co-regent, Michael IX. (1320), Andronicus II. was compelled to divide the throne with his grandson, Andronicus III., who became sole emperor in 1328. This monarch unsuccessfully opposed the Turks, who took Nicæa and Nicomedia in 1339, and wasted the European coasts. He died in 1341. Under his son, Johannes V., the Turks first made a permanent settlement in Europe by the taking of Gallipoli in 1354. In 1361 the sultan Amurath took Adrianople, and made it the seat of government. In 1381 all that remained of the Byzantine empire became tributary to the Turks. Manuel II., son and successor of Johannes, was besieged in Constantinople by Bajazet, who defeated an army under Sigismund of Hungary at Nicopolis in 1396, and compelled the Byzantine monarch to cede to the Turks one of the main streets of the city. The fall of the city seemed inevitable, when it was saved by the advance into Asia Minor of the great Tartar conqueror, Timur, who defeated Bajazet at Angora in 1402. By this diversion Manuel recovered some portion of the Byzantine provinces; but made so little use of the occasion, that in 1422 the metropolis was again besieged by Amurath II., who, after he had overthrown the force sent to aid the emperor by Ladislaus, king of Hungary, at the battle of Varna, made Constantinople in 1444 the limit of the domains of Johannes VII., son of Manuel. Constantine XI., brother of Johannes, bravely but fruitlessly contended against the overwhelming Turkish forces, and fell heroically in the defence of Constantinople, which was captured by Mohammed II., May 29, 1453, when the Byzantine empire was brought to a close. The petty Latin princes who existed here and there in Greece, and the despots, Demetrius and Thomas, who ruled in the Morea, were subdued by Mohammed in 1460; while David, a member of the Comnenian dynasty, the last emperor of Trebizond, submitted in 1461.

It was for long usual for authors dealing with the bloody record of dynastic crimes in the Byzantine empire to affirm that the history of the world never witnessed so degraded a caricature of imperial government. Against all such summary statements Freeman and others energetically protest, declaring that careful study brings the fairer side into relief, and that, on the whole, the history of the fall of the Byzantine empire is the record of a noble struggle in the face of overwhelming odds. For many centuries the empire was a bulwark of Christian culture against Persians, Saracens, and Turks; and it transmitted Christianity to Russian and other Slavonic tribes after long protecting it from them.

The constitution of the Byzantine empire was founded on the institutions of Diocletian and Constantine the Great, and was purely despotic. The emperors, who were consecrated by the Patriarchs of Constantinople, claimed, as the true descendants of the Cæsars, a sovereignty over the West as well as the East, and styled themselves 'rulers of the Romans,' even after Charlemagne had founded a new dynasty. Though great influence was at various times exercised by the clergy as well as by women, courtiers, and ministers, the emperors were pure autocrats, having supreme power in all departments of government, and being themselves superior to all law. By pompous titles, by great splendour of costume, and by a strict observance of an elaborately minute court ceremonial, as well as by the cruel penalties inflicted for any insult offered to the imperial dignity, or to the dignity of the emperor's relatives, they kept themselves sacredly apart from the people. Gradually every-

thing disappeared that might have been a check upon the utter despotism of the supreme power. As early as the 6th century, the consulate was absorbed into the mass of imperial honours, while the traces of the senate which Constantine had established at Byzantium, and which was composed of those on whom the emperor had bestowed the dignity of the patriciate, as well as the chartered privileges of the towns, had entirely vanished in the 10th century. The privy-council, to whom the conduct of the state was intrusted, was arbitrarily chosen by the emperor. The state officials were very numerous, and their respective ranks carefully distinguished. They were raised far above the people by titles and privileges, but were utterly dependent on the throne. Among these the *Domestici* (including many eunuchs) claimed the highest rank as immediate attendants on the emperor. The *Domestici* were made commanders-in-chief of the army. Among them the *Domesticus* of the East (styled, *par excellence*, *Megadomesticus*) held the highest rank, and finally, under the Palæologi, was considered the first civil and military officer of the realm. The provinces were ruled by governors bound to contribute certain sums to the royal revenue, which gave rise to oppressive exactions. No distinction was made between the state-revenue and the privy-purse. For military service, the land was divided into districts (*Themata*); and the army, down to the later times, consisted almost entirely of foreign mercenary troops. The imperial body-guard, or *Spatharii*, were mainly soldiers of Teutonic race, the most noted being the Varangians from Scandinavia. The admiral of the fleet was styled *Megas Dux*. In the midst of constant internal and external disturbances, the administration of justice was grossly neglected and abused, though Justinian and other emperors earnestly endeavoured to establish just laws. See the articles on the principal emperors; the historical sections of the articles **ROME** and **TURKEY**; Gibbon's *Decline and Fall of the Roman Empire* (edited by Bury, 1896-1901); Finlay's *History of Greece*, long the authority for the Byzantine empire (7 vols. 1851-56; new ed. 1877); Gasquet, *L'Empire Byzantin* (1888);

Krumbacher, *Gesch. der Byzantinischen Litteratur* (1891); Bury, *History of the Later Roman Empire* (1889; new ed. 1922), and his *Eastern Roman Empire from 802 to 867* (1912); Oman, *The Byzantine Empire* (1892); F. Harrison, *Byzantine History* (1900); Pears, *The Destruction of the Greek Empire* (1904); Schlumberger's *L'Épopée Byzantine* (4 vols. 1900-5); the *Cambridge Mediæval History* (vol. ii. 1913); Diehl, *Byzance, Grandeur et Décadence* (1919) and *Histoire de l'Empire Byzantin* (1920).

Byzantine Historians have all the literary faults of a period when freedom, originality, and force of intellect and character were repressed by a pedantic despotism. Yet, as they are the only sources of information regarding the vast empire of the East, they are invaluable. The most interesting and instructive among them are those who confine their attention to a limited number of years, and to the events which came under their own observation, or in which they took part. The principal Byzantine historians were collected and published at Paris in 36 vols., with Latin translations, under the editorship of P. Philippe Labbé, a Jesuit, and his successors (1654-1711). This magnificent collection was reprinted, with additions, at Venice (1727-33). In 1828 Niebuhr, assisted by Bekker, the Dindorfs, and others, began a *Corpus Scriptorum Historiæ Byzantinæ*, carried on till 1855 in 48 vols., and continued by the Berlin Academy of Sciences. A series was begun under the general editorship of Professor J. B. Bury in 1898.

Byzantines. See **BEZANTS**.

Byzantium, a city on the Thracian Bosphorus, founded by emigrants from Megara in 667 B.C. It rose rapidly to importance as a seat of commerce, was subject to the Persians (515-478 B.C.), was freed by Pausanias, and was alternately Athenian and Lacedæmonian during the Peloponnesian war. Thrasybulus expelled the Spartans in 390, and the city long enjoyed a kind of independence. It was taken by Severus in 196 A.D., and in 330, under the name of New Rome or Constantinople, it was made the metropolis of the Roman empire. See **CONSTANTINOPLE**.



the third letter of our alphabet, represents historically the third letter of the ancient Semitic alphabet, pronounced as *g* in *go*. The name of this letter is in Hebrew *gimel*, in Syriac *gōmal*; an older form *gamla* is implied by the Greek *gamma*. These forms are alter-

ations of the Semitic word for camel (Assyrian *gammalu*, Hebrew *gāmāl*, Syriac *gamlō*, Arabic *jaml*). The earliest known shape of the letter, $\wedge$ (whence, by gradual alteration, the Hebrew $\beth$), has been plausibly conjectured to represent a camel's head and neck. In Hebrew and Aramaic the letter retained its primitive sound (modified, however, after vowels); in Arabic it is *dz*h (= English J), though some dialects have kept the original pronunciation.

The Greeks adopted the Semitic letter with its original value, but also used it for the sound of *ng* before guttural consonants. In Greek inscriptions it had many varieties of shape, but the form Γ (whence the modern Γ) ultimately became universal. One local type was $\angle$, of which the rounded form $\mathcal{C}$, which passed into the Roman alphabet, is probably a modification.

The Romans adopted the letter with its original sound, but (from some cause, the nature of which is disputed) they also used it for the sound of *K*, which was practically disused, though it retained its place in the alphabet. In the 3d century B.C. the modified form $\mathcal{G}$ (see *G*) was introduced for the sound *g*, and thenceforward $\mathcal{C}$ was used exclusively for the *k* sound, except in the abbreviations $\mathcal{C}$ for Gaius, $\mathcal{Cn}$ for Gnaeus.

In late Latin $\mathcal{C}$ retained the sound *k* except before palatal vowels (*e*, *æ*, *o*, *i*, *y*), in which position this sound gradually developed, in Italy into *tsh*, and elsewhere into *ts*. In the Romanic and Germanic languages $\mathcal{C}$ is sounded *k* before *æ*, *o*, *u*, and consonants, and when final; before palatal vowels its sound has the following varieties: *tsh* (Italian, in some dialects *sh*); *ts* (German, early French); *th* (Castilian Spanish); *s* (Portuguese, Spanish dialects, French, English, Dutch, Danish, Swedish). (For the character $\mathcal{C}$, see *CEDILLA*.) In modern German, Dutch, Danish, and Swedish $\mathcal{C}$ occurs only in words of foreign origin, except in *ch* (for which see below) and in *ck*, used in German and Swedish for *kk*. Recent German orthography avoids $\mathcal{C}$ even in Latin derivatives, writing, e.g., *Konzept* for *Concept*. English has adopted the two French sounds of $\mathcal{C}$, and has developed a third value, *sh*, by change of pronunciation (in *gracious*, &c.).

In Irish, which adopted the Roman alphabet very early, $\mathcal{C}$ is always pronounced *k*; so also in Gaelic and Welsh. Irish uses the dotted $\acute{c}$ for the spirant (= German *ch*), into which the *k* sound is modified under certain conditions.

In Old English, $\mathcal{C}$ expressed both *k* and the palatal sound into which this was sometimes modified. In the 11th century the latter had become *tsh*, so that $\mathcal{C}$ had two widely different values, as in *cyn*, kin; *cild*, child.

In Bohemian, Polish, and Hungarian, $\mathcal{C}$ is *ts* in all positions; *tsh* is expressed in Bohemian by $\acute{c}$, in Polish by *cz*, in Hungarian by *cs*. ($\mathcal{Cz}$ in Hungarian is an older notation for *ts*, now written $\mathcal{C}$.)

The digraph *CH* is practically a separate letter. The Romans used it for the sound *k+h*; in late Latin this became *k*, which remained unchanged before *e* and *i*; hence in Italian it represents the *k* sound before those vowels.

In early High German *Ch* stood for *k+h*; in later German, Dutch, Polish, Bohemian, Welsh, and Gaelic, it represents the guttural (in German also the palatal) unvoiced spirant; so also in the 8th-century spelling of Old English names, as *Coinwalch*, later written *Cenwealh*.

In Spanish and Old French *Ch* = *tsh*; in modern French and Portuguese *sh*. In modern English its sounds are: *tsh*, after old French example; *sh*, in words from modern French; *k*, chiefly in words of Greek origin. In Scottish, from the 14th century, it has been used for the guttural unvoiced spirant (as in German).

In the medieval and modern forms of the letter the resemblance to the Roman $\mathcal{C}$ remains recognisable, the most divergent form being the German script capital $\mathcal{L}$. In the Hiberno-Saxon handwriting the capital had the form $\mathcal{L}$.

The Roman name *cē* (formed on the analogy of *bē*, *B*) has been retained in all the European languages written in Roman characters (of course with the pronunciation required by the orthoepic rules of these languages).

$\mathcal{C}$, in Music, is the sound from which the mathematical proportions of intervals are taken. See MUSIC, SCALE, KEY.

Caaba. See KAABA.

Caaing Whale (*Globicephalus melas*), one of the Cetacea, in the dolphin family, belonging to a genus common in all seas, and oftener stranded than any other 'whale.' The skull is broad and



Caaing Whale.

depressed; snout and brain-case are about equal in length; the front of the nose-like head is rounded by a cushion of fat in front of the blow-hole; there are about a dozen small conical teeth above and below; the fore-limbs are very long (5 feet) and

narrow, and situated far below; the dorsal fin is low and triangular; the tail is deeply forked. The smooth skin of the common species is of a uniform black colour, except a white streak along the ventral surface. The total length varies from 16 to 24 feet, the maximum girth about 10 feet. The caaing whale is very gregarious, and vast shoals of 50 to 100 sometimes impetuously follow their leader ashore, when alarmed and surrounded in a bay or fiord. Exciting scenes of this sort have been frequently witnessed on the Farøe Islands and elsewhere. It is recorded that 1110 were killed in the winter of 1809-10 at Hvalfjord in Iceland. In temper the animals are mild compared with some of their allies. They feed chiefly on cuttle-fishes. Many names are given to these common cetaceans—e.g. Pilot-whale, Black-fish, Social Whale, Grind-hval, &c. The name Caaing or Ca'ing Whale is derived from the Scots word *ca'* for *call* in the sense of 'drive.' Several species are distinguished in different seas, but the characteristics are trivial, and somewhat vague.

Cabal, a term now employed to denote a small, intriguing, factious party, united for political or personal ends. It had been previously used to denote a secret committee or cabinet, when, during 1667-73, it was specially applied to Charles II.'s infamous ministry, consisting of five members, whose initials, by a strange coincidence, made up the word CABAL—viz. Clifford, Ashley (Shaftesbury), Buckingham, Arlington, and Lauderdale. The word goes back through French *cabale* to the Hebrew *kabbalah*, 'something received.' See CABBALA.

Caballero, FERNAN, the pen-name of one of the most popular of more recent Spanish writers. She was the daughter of Nikolas Böhl von Faber (1770-1836), a German merchant in Spain, who had married a Spanish wife, and himself made some real contributions to the history of Spanish literature. Born at Morges in Switzerland in 1797, while her parents were travelling, she spent great part of her childhood in Germany, but returned to Spain in 1813, and in her seventeenth year married a merchant named Planell, whom she accompanied to America. A few years later she found herself a widow, and soon after married the Marqués de Arco Hermoso, two years after whose death in 1835 she married an advocate named Arrom, to become a third time a widow in 1863. The sad circumstances of her third husband's death and her profound dissatisfaction with the liberal political movements of the time clouded her later years with gloom. She died at Seville, April 7, 1877. Fernan Caballero was a prolific writer, but none of her fifty *cuentos* are long. The first was *La Gaviota*, which appeared in 1849 in the pages of the journal *El Heraldo*. Others that may be mentioned are *Elia*, *Clemencia*, *La Familia de Alvareda*. Her *Cuentos y Poetas populares Andaluces* (1859) is important as an early collection of Spanish folk-tales and songs. She herself arranged a collection of her works in 13 vols. (Madrid, 1860-61), but to this must be added the later *Colección de Artículos religiosos y morales* (Cadiz, 1862); *La Mitología contada a los Niños* (Barc. 1873); *Cuentos, Adivinos, Oraciones y Refranes populares é infantiles* (Madrid, 1877); and *Cuadros de Costumbres* (Valencia, 1878). Fernan Caballero possessed the rare gift of story-telling, and had besides a marvellously deep and sure insight into the simple heart of the peasant of Andalusia. Her old-world and somewhat sentimental catholicism sounded strange to the young Spain even of her own day, but added to the charm her stories had for those who held it unwise to destroy before it could be seen what the

world was to gain in exchange for the faith, hope, and charity of the old religion.

Cabanis, PIERRE JEAN GEORGES, a French physician and philosophical writer, born at Cosnac, Charente-Inférieure, in 1757. He commenced life as secretary to a Polish magnate at Warsaw, but soon returned to Paris to study medicine. At the outbreak of the Revolution he attached himself to the popular side; he furnished Mirabeau with material for his speeches on public education; and Mirabeau died in his arms. During the Terror he lived in retirement, and was afterwards a teacher in the medical school at Paris, a member of the Council of Five Hundred, then of the senate. He died near Meulan, May 5, 1808. His chief work is his once-famous *Rapports du Physique et du Moral de l'Homme* (1802). The book is clever, and its absolute sensationalism was so far before its time that its author might well have been suspected to be but burlesquing with grave irony the doctrines of his brother-materialists. The soul is not an entity, but merely a faculty; the brain an organ specially fitted to produce thought, as stomach and intestines accomplish digestion.

Cabatuan, a town of the Philippine Islands, in Panay island, in a district growing rice, maize, and tobacco; pop. 20,000.

Cabbage (*Brassica oleracea*; see BRASSICA), a cruciferous plant cultivated for culinary purposes, and for feeding cattle. The common cabbage is said to have been introduced into England by the Romans, but to have been little known in Scotland until brought by Cromwell's soldiers. The principal varieties are known to have existed at least as far back as the 16th century, but minor varieties are being constantly produced by selection and intercrossing. The varieties (see BRASSICA) differ greatly from each other, and the ancestral wild cabbages yet admit of simple interpretation as terms of a continuous series of simple variations. The parent is of highly vegetative character, as its habitat and habit alike show; and placed in more favourable conditions its growth becomes luxuriant. This vegetative exuberance may be expressed in the simplest way by a growth of the parenchyma of the leaf, which is thus thrown into wavy folds, which are specially developed in the common kale; or the vegetative surplus may be reserved for flowering in various ways. Manufactured in the leaf, this surplus cannot pass away save in the first place through the leaf-stalk; and in one variety, the Portugal or Tronchxuda Cabbage, it remains in the midribs, which consequently become parenchymatous and succulent. More normally, however, it is carried back into the stem, and this may accordingly become swollen and turnip-like, in which case we have the Kohl-Rabi, of which an extreme subterranean and almost turnip-like variety has also arisen, or may be, as in the Jersey Cabbage, largely applied to the purpose of the growth of the stem, which may reach a height of 8 to 10 feet, and furnish not only walking-sticks but even spars for small thatched roofs, &c. The vegetative overplus may however also be applied to the formation of buds, which accordingly develop with peculiar exuberance, giving us Brussels Sprouts, or may be withheld from the lateral buds to be lavished upon the apical one alone, which thus forms the enormous 'head' of the cabbage. From excessive nutrition the flowering of this terminal bud is delayed until its own large and solid non-vegetative bulk, as well as the checking of the vegetation of the external green leaves by the winter, have given the reproductive functions an opportunity of preponderance. The most evolved and final variety is the Cauliflower, in which the vegetative surplus becomes poured into the flowering head, of which

the flowering is more or less checked; the inflorescence becoming a dense corymb instead of an open panicle, and the majority of the flowers aborting, so as to become incapable of producing seed. Let a specially vegetative cabbage repeat the excessive development of its leaf parenchyma, and we have the wrinkled and blistered Savoy, of which the hardy constitution, but comparative coarseness, become also more intelligible; again a specially vegetative cauliflower gives us an easily grown and hardy winter variety, Broccoli, from which, and not from the ordinary cauliflower, a sprouting variety arises in turn.

The whole series of variations from wild cabbage to cauliflower, from leaf to buds in the sprout, lateral to terminal bud in the cabbage, and flower in the cauliflower, are thus seen to be hypertrophied arrestments of a single process, that subordination of vegetative gains to reproductive life which is the normal fact of individual history in the organic world, as well as the essential factor of floral evolution. See BOTANY.

Cultivation.—The cabbage is biennial, consequently the main crop must be sown the autumn previous to that in which it is to be reaped. Field cabbages and the *drumhead* varieties that are used in gardens, being late in character, may be sown in July, or from the third week of that month to the second week of August. But the smaller and early sorts used in gardens should not be sown before the first week of August, nor later than the second week of that month. If the plants are reared earlier, they are apt to run to seed the following spring; and if, on the other hand, they are reared later, they will not acquire strength enough to withstand the cold of winter before it comes upon them. For successive crops to be used in the shape of young summer cabbages, one or two sowings may be made from the beginning of March to the beginning of April. Autumn-sown plants may be planted out in rows permanently as soon as they are strong enough. Additional plantations from the same sowing may be made in spring, to be followed by others, made at intervals up till July, from spring-sown plants. Thus a close succession of usable cabbage may be obtained the year round. In the northern parts of the United States, cabbages for the early summer market are sown about September, kept under glass or frames during winter, and planted out in spring. For later markets, the seed is sown in beds as early as possible in spring (about March), and transplanted later. Cabbages are sometimes preserved for winter by inverting them and burying them in the ground.

Cabbage-coleworts may be obtained from any good early variety of cabbage. They are simply cabbages which are not permitted to form hearts, but are used while the leaves are yet green and the hearts more or less open. Three sowings should be made for the rearing of these, the first about the middle of June, the second about the same time in July, and the third about the last week of the latter month, or the first week of August. These sowings will provide crops of green cabbages from October till March or April, if the winter is not destructive, after which they begin to run to seed.

Cabbage Bark. See ANDIRA.

Cabbage Butterfly, a name common to several species of butterfly, the larvæ of which ('cabbage worms') devour the leaves of cruciferous plants, especially of the cabbage tribe. The Large Cabbage Butterfly, or Large White (*Pieris* or *Pontia brassicæ*), is one of the commonest British butterflies. It is white, with wings tipped and spotted with black. The female is more decorative than the male. The wings, when expanded,

measure from $2\frac{1}{2}$ to 3 inches across. The female lays her conical, bright yellow eggs in clusters of twenty or thirty, on the leaves of the plants which are the destined food of the caterpillars. The spring brood are found usually on wild cruciferæ; the summer set on garden vegetables. The caterpillars, when fully grown, are about 1 inch or $1\frac{1}{2}$ inch long, and are excessively voracious, eating twice their own weight of cabbage-leaf in twenty-four hours. When full grown, they suspend themselves by their tails, often under ledges of garden-walls, or similar projections, and are metamorphosed into shining pale-green chrysalids, spotted with black, from which the perfect insect emerges, either in the same season, or, in the autumn brood, after the lapse of a winter—no longer to devour cabbage-leaves, but to subsist delicately upon nectar.—The Small Cabbage Butterfly, or Small White, sometimes called the Turnip Butterfly (*Pieris rapæ*), very much resembles the former, but the expanse of the wings is only about 2 inches. The eggs are laid singly on the under side of the leaves of cabbages, turnips, &c., and the caterpillars, which are of a velvety appearance, pale green, with a yellow line along the back, and a yellow dotted line on each side, sometimes appear in great numbers, and prove very destructive. They bore into the hearts of cabbages, instead of merely stripping the leaves, like those of the last species, and thus are a greater pest, even when comparatively few. The chrysalis is of a pale yellowish-brown colour, freckled with black.—A third species, also common in Britain, the Green-veined White Butterfly (*Pieris napi*), very nearly resembles the small cabbage butterfly.—The excessive multiplication of these insects is generally prevented by small birds, which devour them and their caterpillars, also by wasps, and by insects of the Ichneumon (q.v.) tribe, which lay their eggs in the caterpillars, that their own larvæ may feed on them. As regards artificial prevention and remedies, the eggs of the large white being laid in clusters can be removed from the cabbage-leaves; the chrysalids should be sought and destroyed; various washings, dressings, and the like are useful, such as sprinklings of salt, watering with lime-water or soap-suds, and dressing the surrounding soil with soot or gas-lime; a good drenching of any kind is often advantageous. The cabbage butterfly has become naturalised in the United States, where it is very destructive. See Miss Ormerod's *Injurious Insects*.

Cabbage-fly (*Anthomyia brassicæ*), a dipterous insect in the same family as the house-fly, flesh-fly, &c., and belonging to a very large genus with about 480 European species, many of which are in their larval state very injurious to vegetables. The adult insect is about a quarter of an inch in length, and has a general ashy-gray colour, somewhat different in the two sexes. The maggots are found in summer on the roots and lower stems of cabbages and similar plants. The pupæ are rusty red in colour, and the last generation lie in the ground throughout winter. The entire development occupies about eight weeks, and there are several successive generations between June and October. The best prevention is probably rotation of crops; the earth round the roots of the cabbages should be drawn away to destroy the pupæ; watering with lime-water will kill the maggots.

Cabbage-moth (*Mamestra brassicæ*), a species of moth, the caterpillar of which feeds on cabbage and turnip leaves, and is sometimes very destructive. The caterpillar is greenish-black, and changes to a chestnut chrysalis in autumn. The perfect insect is predominantly of a rich mottled-brown colour, with beautiful markings. The winter

chrysalids should be destroyed when turned up in digging; the voracious grubs should be picked away from the cabbages, and the stems may be very profitably protected by making a ring in the ground with spirit of tar, quicklime, or gas-lime.

Cabbage-palm, Cabbage-tree, names given to various species of Palm, whose great terminal bud is eaten cooked like cabbage, or sometimes raw in salads. The Cabbage-palm of Brazil and the West Indies is *Areca* (*Euterpe oleracea*). The palmetto, coconut palm (*Cocos nucifera*), and others are sometimes similarly employed, in all cases at the total sacrifice of the tree. The Australian Cabbage-palm is a *Livistona* (*L. mirmis* or *australis*); the 'cabbage' is small, but the leaves, dried and drawn into strips, are plaited to make the 'cabbage-tree hat' which figures conspicuously in accounts of Australian exploration and pastoral life.

Cabbala (also written *Cabala*, *Caballa*, *Qabalah*) means 'that which is received,' i.e. 'tradition,' and is from the Hebrew *kabbalah*, which might be used for any Jewish doctrine not explicitly contained in the Hebrew Bible since the present form of the Biblical text; the moral and ritual precepts of the Talmud are all ascribed to a tradition which can be traced back step by step. But in its technical sense, the Cabbala signifies a secret system of theology, metaphysic, and magic prevalent among the Jews. The Cabbalists taught a pantheistic doctrine, which came to them from the later and degenerate philosophies of Greece—viz. those of the Neoplatonists and Neopythagoreans. But, being Jews, they shared the common Jewish belief that their Scriptures are the fountainhead of all knowledge, and accordingly they read their doctrines into the Bible in all kinds of artificial ways, especially by the mystic significance which they attached to numbers, and the advantage they took of the fact that each Hebrew letter also stands for a numeral. They held that their so-called science was both speculative and practical, because the knowledge of metaphysical laws was supposed to clothe the adept with supernatural power. Thus like the school of the Essenes, like the Alexandrian philosophy, like Christianity itself, the Cabbala sprang from weariness of the dead letter, from a reaction against the petrified Judaism of the Rabbis. It substituted an immanent God, a God who is in nature and one with it, for the strict monotheism of the orthodox Jews.

In the Talmudic treatise 'Chagiga' there is frequent mention of secret knowledge, and in particular of a cosmogony called the 'Work of Genesis,' and a theosophy called, in allusion to the opening chapter of Ezekiel, the 'Work of the Chariot.' We are told that this knowledge is at once very sacred and very perilous, but no details are given. The authoritative documents of cabbalistic doctrine are the 'Sepher Yetsirah,' or 'Book of Creation,' ascribed to Rabbi Akiba, who died 120 A.D., and the 'Sepher Hazzohar,' the 'Book of Brightness' (see Dan. xii. 3), ascribed to Simeon-ben-Jochai, a contemporary of Akiba's. The real dates are very difficult to fix. A book with the title Yetsirah is mentioned by the Gemara in the 5th or 6th century, and by Saadia in the 10th. Possibly the book intended may be substantially identical with that which now bears the name. Zohar, which refers to the Talmud, the Arab empire, &c., cannot be older than the 8th century, and is ascribed by some eminent critics to the 13th. 'Yetsirah' is written in the Neohebraic of the Mishna, Zohar in the Neo-aramaic of the Gemara.

The kernel of the cabbalistic teaching is that all emanates from God, and at every turn we are reminded of the fanciful pantheism of the Gnostics.

There is no creation in the common acceptance of the term, and on the other hand no eternal matter. All that we see is due to the self-development of the Deity. In himself he is the absolute without any attribute, since all attributes limit the being of whom they are predicated. God as the absolute being is also called Adam Kadmon, 'the first or ideal man' (see Ezek. i. 26; Dan. vii. 13). Next he becomes determined by ten attributes, 'wisdom and understanding,' 'mercy and judgment,' &c. These are conceived as male and female, and they are formed into three triplets or Trinities. They constitute 'the world of emanation,' and they are the 'channels' through which the world of pure spirits, the world of angels and heavenly bodies, and the lowest world, that in which we live, have come into being. Man's body represents in its different parts the realities of the upper worlds: his soul has pre-existed, realises its own nature on its descent to this earth, and after transmigration from body to body, returns to God. The sacred character of certain numbers—e.g. of three, of seven, of ten—regulates the mode in which these ideas, half mythological, half philosophical, wholly pantheistic, are arranged; and an interpretation of the Bible based likewise on the significance of numbers, and entirely removed from all rational exegesis, adjusted the Cabbala to the letter of the written word.

The chief cabbalistic writers flourished between the 13th and 16th centuries. Of these R. Moses ben Nachman (1195-1270), better known as Ramban, is the most eminent. More and more, the philosophic were obscured by the magical elements, and orthodox Rabbis justly objected that the worship of ten divine attributes as real beings was an abandonment of Jewish monotheism. Further, cabbalistic sects attached themselves to pretended Messiahs, such as Sabbatai Zevi, born at Smyrna in 1640. The followers of Jakob Frank in Germany (1713-98), and the sect of Chasidim—i.e. 'Pious'—in Poland, were also connected with the Zoharites or Cabbalists. On the other hand, the resemblance between certain features in the emanation doctrine and the Christian Trinity induced some Jews to turn Christian, and made Christians favourable to the Cabbala. Pico della Mirandola (*Conclusiones Cabbalisticæ*, 1486) and the truly great Reuchlin (*De arte Cabbalistica*, 1517) were both eager Cabbalists. See TALMUD.

Cabeiri, mystic divinities chiefly worshipped at Samothrace, Lemnos, and Imbros, but also at Thebes, Pergamos, and elsewhere, were regarded by most early writers as children of Hephaestus, but little is known of their character or the nature of their worship. They are identified by some with Demeter, Persephone, and Rhea; by others with the Dioscuri (Castor and Pollux); by others, again, with the Roman Penates.

Cabell, JAMES BRANCH, novelist, poet, genealogist, journalist, born in 1879 at Richmond, Virginia, has written, besides many short stories and essays, *Jurgen* (1919), *Figures of Earth* (1921), and other romances remarkable for their style and their heroes. *From the Hidden Way* (1916) is a volume of bogus adaptations from old-time troubadours.

Caber, TOSSEING THE, a Scottish athletic exercise or feat, in which a large beam or young tree, heavier at one end than the other, is held perpendicularly balanced against the chest, small end downward, and tossed so as to fall on the heavy end and turn over, the farthest toss and straightest fall winning. Competitions where the powers of the opponents are unknown are generally started with a caber of 24 or 25 feet, from which the thick end is sawn off by degrees, until the proper length is got at. The thin end, held in the hand, should be not more than 3 inches in

diameter; the average length of a good larch caber is about 21 feet.

Cabés, or *Gabes*, a port of Tunis, in a fertile district at the head of the gulf of the same name (ancient *Syrtis Minor*). It was in the 5th century a bishop's seat, and in the 10th a rich and strongly fortified town. The harbour admits small vessels only. Pop. about 10,000.

Cabet, ÉTIENNE, a notable French communist, was born at Dijon in 1788, and educated for the bar, but turned his attention to literature and politics. Under the Restoration, he was one of the leaders of the Carbonari (q.v.), and in 1831 was elected deputy for the department of Côte d'Or. Soon afterwards, he published a *History of the July Revolution* (1832), started a Radical Sunday paper, *Le Populaire* (1833), and on account of an article in this paper, was sentenced to two years' imprisonment, but escaped to London. After the amnesty, 1839, he returned to Paris, and published a *History of the French Revolution* (4 vols. 1840), bestowing great praise on the old Jacobins. He attracted far more notice by his *Voyage en Icarie* (1840), a 'philosophical and social romance,' describing a communistic Utopia. The work obtained great popularity among the working-classes of Paris. Cabet next proceeded to send an 'Icarian colony' to the Red River in Texas, but the colonists who went out in 1843 found Texas anything but a Utopia. Their ill fortune did not deter Cabet from embarking at the head of a second band of colonists. On his arrival he learned that the Mormons had just been expelled from Nauvoo in Illinois, and that their city was left deserted. The Icarians established themselves there in 1850. Cabet's efforts, however, were not successful. He was finally obliged to leave Nauvoo and retire to St Louis, where he died in 1856. See Shaw's *Icaria* (1884), and books by Prudhommeaux (1900-7).

Cabinda, a small Portuguese territory on the west coast of Africa, delimited in 1886, bounded on the E. by Belgian Congo, which on the S. separates it from the mouth of the Congo. The capital, Cabinda, was formerly a noted slave port; pop. 8000, now chiefly engaged in boat-building and coast trading.

Cabinet, in Great Britain, is the body of ministers who carry on the government. It is an institution which has gradually grown out of the needs and exigencies of our political life, and is now an essential part of our polity. 'Yet,' says Macaulay, 'it still continues to be altogether unknown to the law; the names of the noblemen and gentlemen who compose it are never officially announced to the public; no record is kept of its meetings and resolutions, nor has its existence ever been recognised by any Act of Parliament.' In former times the Privy-council were the advisers of the crown, but as the Privy-council was a large body, a small informal council of royal advisers grew up within it. This became marked under the Stuarts, especially Charles II. The rise of the cabinet as we know it, however, really dates from the revolution of 1688 and the effectual establishment of parliamentary government. The members of cabinet are the leaders of the majority of the House of Commons, and the position of the cabinet as the executive government marks the supremacy of the representatives of the people. It was a considerable time after the revolution of 1688 before this state of things received its full development. As William III. was a foreigner raised to the throne by a revolution and dependent on parliament, it was during his reign about 1693 that the cabinet in its modern form originated. But for some generations the cabinet was a loosely arranged body of ministers without a fully acknowledged

chief, without full powers, and without a fully developed collective policy. The aim and tendency of the personal rule of George III. was to degrade the cabinet into ministers dependent on himself. Even so late as 1834, William IV. took it upon him to dismiss a cabinet which was objectionable to himself personally. At present, in the event of a change of government, the royal initiative is confined to the duty of 'sending for' the leader of one of the great parliamentary parties. The particular leader may not always be definitely indicated, in which case the sovereign exercises a certain discretion. With regard to the cabinet generally, it may be said that while composed of members of both Houses of Parliament, it must depend on the majority of the House of Commons; it must be united on the leading questions of the day, and must follow a common policy; and it acknowledges a collective responsibility to parliament for its principal acts. The sense of collective responsibility was relaxed in Mr Lloyd George's cabinet. As the executive organ of parliament it is very elastic, and, while subject to considerations of use and wont, its action can be suited to the exigencies of time and circumstance. As a rule it includes the First Lord of the Treasury, the Lord Chancellor, the Lord President of the Council, the Lord Privy Seal, the secretaries of state, the Chancellor of the Exchequer, and the First Lord of the Admiralty. With other members it usually numbers about eighteen, but a large cabinet is not an advantage. In 1916-19 there was a small inner 'war cabinet' of five to seven members, including latterly General Smuts, a South African minister. These, with representatives of the dominions, formed an 'imperial war cabinet.'

In the United States the cabinet consists of the Secretary of State, the Secretaries of the Treasury, of War, of the Navy, of the Interior, of Agriculture, of Commerce, and of Labour, the Attorney-general, and the Postmaster-general. These are the heads of their respective departments, and in their collective capacity act as Advisory Board to the president. They are appointed to office by the president, but their appointments must be confirmed by the senate, and they generally hold office until their successors are appointed and confirmed. Contrary to the English system, the United States cabinet-ministers must not have seats in congress; there is no premier, and the president, not the ministers, is responsible for the acts of the government. The salary of members of cabinet is \$12,000 a year.

The word cabinet, it may be added, is frequently used for analogous institutions in other countries.

Cable, GEORGE WASHINGTON, a popular American author, was born in New Orleans, October 12, 1844. He had early to shift for himself, and at nineteen volunteered into the Confederate service. He saw some hard service, and in one action was severely wounded. After the war he earned for some time a precarious living, and finally found himself laid up with malarial fever caught at survey work on the Atchafalaya River. During his two years' illness he began to write for the New Orleans papers, and his success ere long was such as to encourage him to devote himself to the literary craft. His sketches of Creole life published in *Scribner's Monthly* made his reputation, revealing as they did to the world an interesting phase of American social life hitherto unknown. His keen observation and dexterous literary use of the Creole dialect at once found him a public on both sides of the Atlantic. Among his books are *Old Creole Days* (1879), *The Grandissimes* (1880), *Madame Delphine* (1881), *Creoles of Louisiana* (1884), *The Silent South* (1885), *Bonaventure* (1888), *John March* (1895), *Strong Hearts* (1899), *The Cavalier* (1901), and *Bylow Hill* (1902). By writing and lecturing he secured important reforms

in contract convict labour in the southern states, brought about mainly through his own pen.

Cable is either a large rope or a chain of iron links, chiefly employed on shipboard to suspend and retain the anchors. Rope cables are made of the best hemp or of wire, twisted into a mass of great compactness and strength. The circumference of hemp-rope varies from about 3 inches to 26. A certain number of yarns are laid up left-handed to form a *strand*; three strands laid up right-handed make a *hawser*; and three hawsers laid up left-handed make a *cable*. The strength of a hemp cable of 18 inches circumference is about 60 tons; and for other dimensions, the strength is taken to vary according to the cube of the diameter. Wire-rope has within comparatively recent times been to a certain extent taking the place of hemp for tow-line and hawsers on board ship. These usually consist of six strands, laid or spun around a hempen *core*, each strand consisting of six wires laid the contrary way around a smaller hempen core. The wires are galvanised or zinc'd, or else coated with a preservative composition. Wire-ropes are usually housed on board ship by winding them round a special reel or drum. Hemp cables, moreover, have for long been almost wholly superseded by chain cables; the introduction of steam on board ship having brought in its train the powerful steam-windlass wherewith to manipulate the heaviest chains and anchors required. Hempen and wire ropes are of course invariably used as tow-lines and for mooring vessels.

Chain cables are made in links, the length of each being, generally, about 6 diameters of the iron of which it is made, and the breadth about $3\frac{1}{2}$ diameters. There are two distinct kinds of chain cables—the stud-link chain, which has a tie or stud welded from side to side, and the short-link or unstudded chain. (As to mode of making chain cables, see under CHAINS.) The cables for use in the mercantile service are made in 15 fathom lengths, but in government contracts chain cables are required to be made in $12\frac{1}{2}$ fathom lengths, with one swivel in the middle of every alternate length, and one joining-shackle in each length. Besides the ordinary links and joining-shackles, there are end-links, splicing-tails, mooring-swivels, and bending-swivels. The sizes of chain cables are denoted by the thickness of the rod-iron selected for the links. The following table gives certain ascertained quantities concerning the cables in ordinary use:

Thickness of Iron.	Weight of Stay-plate.	Weight per Fathom.	Breaking Strain.
$\frac{1}{2}$ in.	$\frac{1}{2}$ oz.	$13\frac{1}{2}$ lb.	6 tons.
1 "	$3\frac{1}{2}$ "	54 "	24 "
$1\frac{1}{2}$ "	12 "	121 "	60 "
2 "	28 "	215 "	99 "
$2\frac{1}{2}$ "	40 "	272 "	126 "

Compared with the strength of hempen cable, 1 in. diameter chain cable is equivalent to $10\frac{1}{2}$ in. circumference hemp, $1\frac{1}{2}$ in. to $13\frac{1}{2}$ in., $1\frac{1}{2}$ in. to 16 in., $1\frac{1}{2}$ in. to 18 in., and 2 in. to 24 in.

By the Chain Cables Act of 1871, certain bodies are licensed to erect machines for testing all chain cables and anchors; and it is forbidden to sell or purchase any chain cable or any anchor weighing more than 168 lb. which has not been duly tested.

Minor alterations were introduced in 1874; and the Anchors and Chain Cables Act (1899) simplified and amended the law. For submarine cables, see TELEGRAPH; and for cable tramways, TRAMWAY.

Caboched, or **CABOSSED**, an heraldic term, from the old French word *caboche*, 'the head.' When the

neck, and exhibited full in face (or *affronté*), it is said to be caboched.

Cabot, or **CABOTTO**, GIOVANNI, discoverer of the North American mainland, was a Genoese, naturalised in 1476 in Venice, who settled about 1490 as a merchant in Bristol, where he is supposed to have died about 1498. Under letters-patent from Henry VII., dated 5th March 1496, he set sail from Bristol in 1497, with two ships, accompanied by Lewes, Sebastyan, and Sancto, his sons, and on 24th June sighted Cape Breton Island and Nova Scotia. He seems also to have coasted along Newfoundland. Letters-patent were granted, 3d February 1498, for a second expedition; but whether any voyages were made under these is doubtful.—The same uncertainty exists as to the birthplace of his second son, SEBASTIAN, who, it now appears most probable, was born at Venice in 1474. Sebastian's name is associated with that of his father in the charter of 1496, and in 1499 he appears to have sailed with two ships in search of a North-west Passage, and followed the American coast from 60° to 30° N. lat.; but it has been considered doubtful whether this voyage also should not be assigned to his father. We hear no more of Sebastian till 1512, when he appears to have attained some fame in England as a cartographer, in which capacity he entered the service of Ferdinand V. of Spain in the same year. A contemplated voyage of discovery to the North-west was frustrated by the death of the king in 1516; and the jealousy of the regent, Cardinal Ximenes, impelled Cabot to return to England in 1517. During this visit he appears to have been offered by Henry VIII., through Wolsey, the command of an expedition which, through either the cowardice or malice of Sir Thomas Perte, who was appointed his lieutenant, 'tooke none effect;' but whether the expedition ever left England or not has been disputed. In 1519 Cabot returned to Spain, and was appointed pilot-major of the kingdom by Charles V., for whom, in 1526, he commanded an expedition which examined the coast of Brazil and La Plata, where he endeavoured to plant colonies. The attempt ending in failure, he was imprisoned for a year in 1530, and banished for two years to Oran, in Africa. In 1533 he obtained his former post in Spain; but in 1547 he once more betook himself to England, where he was well received by Edward VI., who made him inspector of the navy, and gave him a pension. To this monarch he seems to have explained the variation of the magnetic needle in several places, which he was among the first, if not the very first, to notice particularly. In 1553 he was the prime mover and director of the expedition of Merchant Adventurers which opened to England an important commerce with Russia. He seems to have died in London in 1557. Of his famous map (1544), embodying the discoveries of his father and himself, one example exists, preserved in the Bibliothèque Nationale at Paris.

Among monographs on the Cabots are those by Nicholl (1869), Harris (Paris, 1882; Eng. trans. 1896), Dawson (1895), Weare (1897), and C. R. Beazley (1898); see also the histories of America by Winsor (1885), Avery (1905), and Bushnell Hart and others (1900-5).

Cabourg, a village in the French department of Calvados, near the mouth of the Dives, 11 miles SW. of Trouville by rail, much visited for sea-bathing. It has fine sands, a raised terrace-promenade, a casino, and all the equipments of a fashionable watering-place. It has been proposed to establish a fortified port here.

Cabra, a town of Spain, 37 miles SE. of Cordova, on a stream of the same name (a tributary of the Jénil), has an old castle, a college, and an active wine trade; pop. 13,000.



Stag's Head caboched.

head of an animal is borne, without any part of the

Cabral, or CABRERA, PEDRO ALVAREZ, the discoverer—after Pinzon—of Brazil, was born about 1467 of a good old Portuguese family. After Vasco da Gama's first voyage, the king appointed Cabral to the command of a fleet of 13 vessels, carrying 1200 men, and bound for the East Indies. On the 9th March 1500 he sailed from Lisbon. To avoid becalming off the coast of Africa, he took a course too far westerly, fell into the South American current of the Atlantic, and was carried to the unknown coast of Brazil, of which, on 25th April, he claimed possession for the king of Portugal, naming the new country 'Terra da Santa Cruz.' After sending home one vessel to bear news of his accidental discovery, Cabral sailed for India; but on 29th May four of his vessels foundered, and all on board perished, including Diaz the great navigator; and soon afterwards three more vessels were lost. Cabral therefore landed at Mozambique, on the east coast of Africa, of which he first gave clear information, and sailed thence to Calicut, where, having made the terror of his arms felt, he was permitted to found a factory, entered into successful negotiations with native rulers, and thus established the first commercial treaty between Portugal and India. He returned with a considerable booty, and dropped anchor at Lisbon, 31st July 1501. He probably died about 1520. See Life by J. R. McClymont (1914).

Cabrera, one of the Balearic Isles (q.v.), uncultivated, but producing wild olives. Area, 8 sq. m. There is a good harbour, with a fort. The island is used by the Spanish government as a penal settlement, and was crowded with French prisoners during the war in the Peninsula.

Cabrera, DON RAMON, Carlist leader, was born at Tortosa, Catalonia, in 1810. Intended for the church, he had already received the minor orders, when the death of Ferdinand in 1833 gave the signal for civil war. Cabrera at once joined the *absolutists*, or partisans of Don Carlos, and by his energy, daring, and pitiless cruelty—at least after the shooting of his aged mother by Mina (1836) for treasonable correspondence—soon made his name a household word throughout Aragon and Valencia. Defeated and severely wounded at Rancon, he escaped with difficulty into the woods, but soon reappeared at the head of a really formidable force, overthrew the royal army at Buñol and at Burjasot, and though vanquished at Torre-Blanca, he soon after reopened the war with fiery energy, and even for a time threatened Madrid itself. In 1839 Don Carlos created him Count of Morella and governor-general of Aragon, Valencia, and Murcia; but Marotto's treachery obliged him to act solely on the defensive, and in July 1840 he was driven across the French frontier. In 1845 he strongly opposed Don Carlos's abdication of his rights, and in 1848 renewed the struggle for absolutism in Spain; but the adventure proved a miserable failure, and early in 1849 he had to recross the Pyrenees. He afterwards married a wealthy English lady. When Alfonso was proclaimed king of Spain in 1875, Cabrera published a manifesto advising the Carlists to submit to him, as a good son of the church. He died at Wentworth, near Staines, 24th May 1877.

Cabs derive their name from the cabriolets de place introduced into England from Paris at the beginning of the 19th century. As early as 1672, we are informed, on the authority of Count Gozzadini, that cabriolets, or gigs with hoods, 'an affair with a curved seat fixed in two long bending shafts, placed in front on the back of a horse, and behind on two wheels,' were introduced from Paris into Florence, where they so rapidly increased that in a few years they numbered over one thousand.

These vehicles appear to be the original of the *carriole* of Norway, the *calesso* of Naples, and the *volante*, a hooded gig on two very high wheels, of Cuba. In Paris the cabriolet de place was introduced about the middle of the 17th century by Nicholas Sauvage, whose residence in the Rue St Martin at l'Hôtel St Fiacre has given the name of *fiacres* to the public carriages of that city. In 1805 Messrs Bradshaw and Rotch obtained licenses for eight cabriolets which were started in London; and a newspaper of April 23, 1823, states that 'cabriolets were in honour of his majesty's birthday introduced to the public this morning. They are built to hold two persons inside, besides the driver (who is partitioned off from his company), and are furnished with a book of fares . . . which are one-third less than the hackney coaches.' These two-wheeled cabs, built by Mr Davies, had a body somewhat similar to the 'hansom,' but smaller, the forepart of the head being capable of being folded. Their number was, owing to the opposition of vested interests, at first limited to twelve. They were painted a yellow colour, and stood for hire in a yard in Portland Street, Oxford Street. They speedily acquired great popularity, and in 1832, when all restrictions as to numbers were removed, had reached a total of sixty-five. Ultimately they displaced the hackney coaches (public vehicles are still officially designated 'hackney carriages'). First used in England about 1605, these were chiefly the discarded carriages of the nobility utilised and licensed for public use. In 1625 their number was restricted to fifty, thirty-seven years later they had increased to 400, when the government began to impose a tax of £5 upon each vehicle, and in 1715 their total reached 800. By reducing their size, and building the under-carriage shorter than those of the nobility, great improvement was effected (1790). The cabriolet de place, which, as we have seen, gradually displaced the hackney coach, was itself succeeded by a cab patented by Mr Boulnois. It was drawn by one horse, and carried two passengers facing each other, the driver being seated on the top, the vehicle having a door behind. This falling out of fashion, a larger cab, of the brougham type, but smaller and plainer, for two persons, came into use in 1836. On this design the Clarence four-wheeler was founded.

The introduction of the hansom patent safety cab, named after the inventor, the architect of Birmingham town-hall, marked a new era in rapid street locomotion. The patent was taken out in 1834. The hansom originally consisted of a square body, the two wheels, about 7½ feet in diameter, being the same height as the vehicle. Numerous improvements were made upon this, and in 1836, a fresh patent being taken out by Messrs Gillett and Chapman, a company was formed for establishing hansom cabs. From that time there was a steady advance made in the construction and appointments of the hansom. Those introduced by Lord Shrewsbury claim special notice for their convenience and smart appearance. Among later improvements is the use of a folding framework hood, permitting the vehicle to be used either open or closed. Cabs with india-rubber tires followed, and steadily advanced in favour. A three-wheeled cab, a new invention, was licensed in 1887.

The taximeter, which on the Continent had been for some time in general and in some towns almost in universal use, both on horse-cabs and on motor-cabs, for the automatic regulation of fares, has in Great Britain been associated with the coming of the motor-cab. This vehicle was introduced in London in 1897, but was not at first successful. Since then, however, its success has been such as to cause a crisis in the cab trade and no little

distress among drivers of the horse-cab, now largely superseded.

Cabs in Great Britain are subject to police and municipal regulation. In London the principal acts are the Metropolitan Streets Act, 1867; the Metropolitan Public Carriages Act, 1869; the London Cab Act, 1896; and the London Cab and Stage Carriage Act, 1907. The act of 1867 consolidated and amended previous acts relating to cab and vehicular traffic in London; that of 1869 made special regulations for the granting of licences, the inspection of cabs, and the qualifications of drivers. Outside London cabs are usually regulated by private acts incorporating the Town Police Causes Act, 1847, an act with provisions similar to those of the London acts.

Cabmen's shelters, founded 1875, to afford drivers accommodation and shelter when on the stands, have proved of great service to the men, and have greatly promoted habits of sobriety. The Cab-drivers' Benevolent Association was founded in 1870 to grant annuities and give legal and pecuniary assistance to cab-drivers and their widows; and a Home of Rest for Horses in 1887 to provide rest for overworked cab horses.

Cabul. See KABUL.

Cacao. See COCOA.

Caccamo, a town in the province of Palermo, Sicily, 5 miles SW. of Termini, with mines of agate, Jasper, and beryl; pop. 12,000.

Caccini, GIULIO, musician, was born in Rome about the middle of the 16th century. After studying under Scipione della Palla he betook himself to the Florentine coast, where during the rest of his life he took a leading part in the movements then affecting the history of music. In particular, his experiments, with those of Peri, in the resuscitation of the ancient Greek drama with musical accompaniment, resulted in the invention of opera. He composed in this kind *Il Combattimento d'Apolone col Serpente* (1590), *Dafne* (1594), and with Peri the highly successful *Euridice* (1600). The last-named was produced at the marriage of Henry IV. of France and Maria de' Medici. He also published a book of songs, *Nuove Musiche*, with remarks on the art of singing. He died about 1618.

Cáceres, the second largest province of Spain, in the north of Estremadura, owned chiefly by large proprietors, and mostly devoted to cattle-raising; the northern half is a good wine country. The area is nearly 8000 sq. m., and the population over 400,000.—The capital, Cáceres, 45 miles N. of Merida by rail, is famous for its bacon and sausages, and has a bull-ring of granite, dye-works, and manufactures of woollens, crockery, and rope. It was the *Castra Cæcilia* of the Romans, by whom it was founded in 74 B.C.; and here the allied forces defeated the rear-guard of the Duke of Berwick, 7th April 1706. Pop. 24,000.

Cachalot is a name for the Sperm Whale. See WHALE.

Cachao. See HANOI.

Cachar, a district of British India in the province of Assam, bordering on Manipur; area, 3769 sq. m.; pop. 500,000. The staple crop is rice. Next in area, but much more valuable, is tea. The tea-plant was discovered growing wild here in 1855, since which time the tea-growing industry has become highly important, about a fourth of all the tea exported from Assam coming from this district. Its forests are considered practically inexhaustible, and timber is exported to Bengal. The town of Silchar is the administrative headquarters.

Cache (Fr., 'hiding-place'), in Canada and the western states of America, and now generally, a hole dug in the ground for concealing provisions and other articles cumbrous to carry.

Cachet, LETTRES DE. See LETTRES DE CACHET.

Cachexia (Gr. *kakos*, 'bad'; *hexis*, 'habit'), a term used in medicine of an obviously unhealthy condition of the body. It is chiefly used in regard to chronic diseases, where the general nutrition is defective, and the blood in an unhealthy state. Thus, Cancerous Cachexia indicates the peculiar impoverished state of the blood and general debility which are associated with the deposits of cancer in various parts of the body; Gouty Cachexia, the state of the general system in gout, as opposed to the mere local attack of gout in the foot. Lead Cachexia is used of the condition of general enfeeblement which sometimes results from the slow absorption of lead into the system; Mercurial Cachexia similarly in chronic poisoning by mercury. Cachexia Strumipriva is the name applied to the peculiar condition found to result from removal of the thyroid gland.

Cacholong, a beautiful mineral, regarded as a variety of semi-opal; see OPAL. It is sometimes called Pearl Opal, or Mother-of-pearl Opal. It is generally milk-white, rarely yellowish or reddish.

Cachucha, less correctly Cachuca, in music, is a Spanish dance-form in 3-4 time, similar to the bolero.

Cacique, or CAZIQUE, the designation given to the chiefs of Indian tribes in works relating to Central and South America. The word was formed by the Spaniards from a native Haytian word.

Cacodyl, or KAKODYLE, is an organic substance containing carbon, hydrogen, and arsenic (CH₃)₂As, with an unbearable smell. Cacodylic acid has been used with profit in consumptive cases. The oxide of cacodyl ((CH₃)₂As)₂O, otherwise known as Cadet's fuming liquor or alkarsin, has the remarkable property of taking fire spontaneously when exposed to the air, and evolving abundant and exceedingly poisonous fumes of arsenic.

Caçongo, or KAKONGO, formerly a district of Guinea, Africa, extending along the South Atlantic Ocean, in 5° S. lat., just north of the mouth of the Congo. The Caçongo River enters the sea in 5° 12' S. This territory was claimed by the Portuguese, and Cabinda (q.v.) is the north part of it; the south and east to the Congo have been absorbed in Belgian Congo.

Cactaceæ, an order of archichlamydeous dicotyledons, consisting of succulent shrubs of very singular appearance. Linnæus included all the Cactaceæ in the single genus *Cactus*, which is now divided into a number of genera, with about 1000 species; the name *Cactus*, however, still continuing in popular use, common to the whole order. The cactuses are almost without exception natives of America, and their extraordinary forms give a remarkable character to the vegetation of its warmer regions. One is found in Ceylon, and one is a probable native of West Africa. Most of them are leafless, but Pereskia, the tree-cactus of the West Indies and Central America, has in some of its species large oblong elliptical deciduous leaves, somewhat succulent, but essentially similar to those of ordinary plants. But in adaptation to the excessive poverty and dryness of the soils in which they flourish, and especially to the protracted droughts and torrential rains which characterise the dry and the rainy season, the leaves are frequently reduced to spines, or mere abortive scales, with their axillant buds developed merely as a wart bearing a tuft of spines, or even reduced altogether. The vegetative functions are thus thrown entirely upon the stem, of which the rind-parenchyma or cellular envelope (see BARK) becomes of great succulence, often forming the greater thickness of the stem, although a small central woody bundle can, of course, always be

distinguished. The stem may become flattened, as in the Prickly Pear (*Opuntia*), or more frequently be thrown into ridges and furrows, so as to increase the vegetative surface. Protected by its dense and continuous epidermis, the bulky stem of the cactus is thus enabled to store a vast supply of water in the spongy bark and pith, and thus withstand the drought and sun of the most rocky and desert situations, of which they often cover large tracts. On this account they are often of great value as sources of water-supply to man and animals; and travellers upon the Mexican plateau have described how the herds of half-wild horses break down branches of *Cereus* with their hoofs, or kick open the spheroidal *Melocactus*, to quench their thirst. Hence such forms have been called 'springs in the desert.' Some are copiously branched (*Phyllocactus*), and sometimes spreading or trailing. Usually, however, the branches are rarer and inserted with peculiar stiffness (*Opuntia*). In yet more specialised forms the checking of the vegetative buds reduces branching still further, or even stops it altogether, as in the tall upright pillar-like and generally unbranched *Cereus giganteus*, which gives such a strangely monotonous, almost architectural rather than vegetative character to the deserts of New Mexico. Finally, even upward growth ceases, and we have merely the short, thick, spheroidal stems, like those of *Echinocactus*, *Melocactus*, *Mammillaria*, &c., which of course furnish the ultimate term



Cacti :

a, *Cereus giganteus*; b, *Opuntia coccinellifera*; c, *Mammillaria pectinata*; d, *Phyllocactus anguliger*.

of the series. This reduction of the vegetative system, as might be expected, is usually accompanied by a reduction of size. Some grow rapidly on old lavas, and disintegrate them by their penetrating roots, so preparing a soil for other plants; the prickly pear is often planted in Sicily by the mere insertion of a joint of it in a fissure of the lava. Many species are Epiphytes (q.v.) in American forests (e.g. *Rhipsalis*); others range

far up mountain slopes, some Mexican forms almost reaching the snow-line. The peculiar vegetative character, which constitutes the most striking peculiarity of the order, leads to the employment of species of *Cereus* and *Opuntia*, &c., in the formation of hedges of great strength and impenetrability, especially in Mexico and the West Indies. Hence the *Opuntia* has been introduced into the Mediterranean countries, where, in conjunction with the Agave and the native Fan Palm (*Chamærops*), it frequently gives a curiously American character to the landscape. The stems of similar species are used for posts and spars, as also for fuel, especially in districts of Peru and Chile, where timber is scarce; and the wood of old *Opuntia* stems has been used by cabinetmakers.

The cultivation of the cactus family has long been increasingly popular, not so much on account of the frequent beauty or rarity of their flowers as the bizarre and often grotesque vegetative forms, of which the effect is heightened by the spines, which often densely clothe the whole plant, especially in the spheroidal forms, where they may also be replaced or supplemented by a thick growth of woolly or silky hairs.

Some species are easily grown, but their extensive cultivation requires a separate cactus-house, in which the natural conditions of extreme drought during great portion of the year can be imitated. Most of them are easily propagated by branches, which are usually allowed to dry a little before being planted. Those like *Melocactus*, which does not readily produce branches, can be made to do so by cutting or burning out the solitary apical bud.

The flowers are often of great size and beauty, and are remarkable for their floral envelopes, of which the constituent leaves run in spirals instead of whorls, and are thus insensibly gradated from small green foliage leaves with axillant spiny buds into large and splendid petals. The stamens are also indefinite, the style single, and the stigma three-lobed. The flowers are usually very short-lived; in some night-flowering species, such as the well-known *Cereus grandiflorus*, common in hot-houses, the flower only opens after dark, and perishes before morning.

The fruit is sometimes termed a berry, but not with justice; since the presence of leaves and spine-tufts over its whole outer surface clearly shows we have to do, as in the rose, with a succulent axis, into which the ovary is depressed. The fruit of many species, especially of *Opuntia*, is edible and wholesome (see PRICKLY PEAR), and the same genus is further of importance as the food-plant of the cochineal insect. See COCHINEAL.

Cacus, a son of Vulcan, was a huge giant who lived in a cave on Mount Aventine. Having stolen and dragged into his cave some of the cattle which Hercules had carried away from Geryon in Spain, he was killed by that hero, who discovered his place of hiding by the lowing of the oxen within, in response to the lowing of the remainder of the flock as they were passing the entrance of the cave.

Cadamba, or KUDUMBA, the wood of several species of *Uncaria*, an Indian genus of *Cinchonaceæ*. *U. (Nauclea) Gambir* is the source of gambier. See CATECHU.

Cadastral Maps are maps on a large and complete scale. Properly a cadastral survey is made by the government for fiscal purposes; the word being derived through the French from Ital. *catastro*, which is from the low Lat. *capitastrum*, 'a register for a poll-tax' (Lat. *caput*, 'the head'). See ORDNANCE SURVEY.

Caddis-fly (*Phryganea*, &c.), a name common to the members of a very distinct family of Neuropterous insects. The family (*Phryganeidae*) is co-extensive with a special division of the order known as *Trichoptera*, and regarded by some as a foreshadowing of *Lepidoptera*. The adult insects are somewhat moth-like, and the larvæ often not unlike caterpillars. The two pairs of wings are different; both bear hairs or scales, but the posterior pair are usually broader and can be folded. The mouth organs are not adapted for mastication, the mandibles are degenerate and membranous, and the first pair of maxillæ are fused to the second. Besides these more distinctive features, the caddis-flies have the following general characters: the head is small, the antennæ long and bristle-like, the compound eyes hemispherical, the eye-spots three in number, the wings with very few transverse veins or none, the feet with attaching processes. The adults are very active, especially in the evening and at night.

The eggs are laid in gelatinous masses on plants or stones near or in the water. Into this the larvæ speedily pass, and surround themselves with a sheath usually composed of minute fragments of wood, grass, moss, leaves, stone, shell, and the like, bound together by the silken secretion of a spinning gland which opens on the second pair of maxillæ. Within these tubes the larvæ are both masked and protected. Sometimes they are fixed, sometimes carried about. The tubes which are open at both ends vary greatly, but seem to be constant for the species. Two British species (*Setodes*) have a primitive type of tube, which is silken and nothing more. Sometimes a few strips of grass stem are simply glued on, but in most cases the sheath is complex, definite, and composed of a multitude of little fragments. In *Helicopsyche* the sheath is spirally twisted like a minute snail-shell. The larvæ feed principally on aquatic plants, and are in turn much eaten by fishes and other animals. The abdomen of the larva discharges aquatic respiration, and bears external respiratory filaments. These are absent in *Enoi-cycla pusilla*, which lives out of the water amongst moss at the roots of trees. After a while the larva

water into aerial life. Some of the smaller species rise to the surface in their cases, and take wing thence, as from little boats.

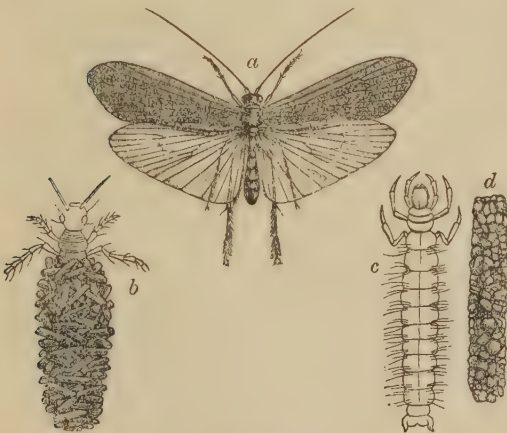
The caddis-flies form the largest family of Neuroptera; some 800 species are known; of some 500 European forms, about 200 occur in Britain. Besides the typical genus *Phryganea*, with the very common species *Phryganea striata*, *Limnophilus*, *Brachycentrus*, *Setodes*, &c. are represented by British species. The larvæ, very common in ponds and streams in spring, are known as caddis-worms to anglers.

Cade, JACK, leader of the insurrection of 1450, seems to have been sadly slandered by Shakespeare. 'The Captain of Kent' was also known to his contemporaries as Mortimer, was possibly connected with that noble house, and, though apparently born in Ireland, was certainly a man of position and property in Kent. Holinshed says he was a 'young man of a goodly stature and right pregnant of wit.' Buckingham and Archbishop Stafford found him 'sober in talk, wise in reasoning, arrogant in heart, stiff in opinions.' The commons of Kent, with great part of the gentry and mayors of cities, rose against the intolerable misgovernment of the Duke of Suffolk and the gross mismanagement of the French war; and the demands formulated by Cade—so far from approaching the communistic tendency of Wat Tyler seventy years before—were almost entirely for political and judicial reforms, suggested by grievances that Stubbs fully recognised. He showed singular generalship in managing an undisciplined army of some 40,000 men, and after a sharp engagement was master of London for three days; two or three of Suffolk's unpopular ministers had been put to death ere Cade was in command. The feeble king, Henry VI., had withdrawn to Kenilworth, and the citizens at first welcomed the movement. But by exacting money from some wealthy merchants the leader of the revolt turned the citizens against him; admission to the city was now denied him, and his followers were repeatedly repulsed by the Londoners. Official promises not meant to be kept helped to weaken Cade's following, and his dispirited army melted away. He made a futile attempt on Queenborough, and then fled to the Sussex weald, where, in a garden near Heathfield, a Kentish squire fought him and killed him (13th July 1450). His body was cut up and his head and quarters sent to adorn spikes on various city walls. See Clayton's *True Story of Jack Cade* (1910).

Cadell, ROBERT (1788-1849), partner in the publishing-house of Constable and Co., Edinburgh, began business again after Constable's failure, and realised a handsome fortune by his various editions of Scott's works.

Cadelle (*Trogosita mauritanica*), a coleopterous insect sometimes found in granaries in Britain, but seemingly imported from more southerly countries, where, as in France, its larvæ often commit great ravages among stored corn and meal. They also live on bread, almonds, and even rotten wood. When full grown, they are about three-quarters of an inch long, flattened, fleshy, rough with scattered hairs, whitish, tapering towards the head; which is black, horny, and furnished with two curved jaws. The perfect insect is a glossy beetle of a deep chestnut colour, marked with dotted lines. The adults are found in rotten wood, under bark, and in stores of edible materials. The family to which *Trogosita* belongs (*Nitidulidae*) is a very large one, and the members (800 species) are widely distributed.

Cademosto, ALOYS DA, explorer, born in Venice about 1432, traded along the Mediter-



Caddis-fly:

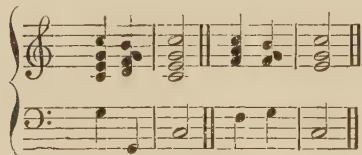
a, Perfect insect (*Phryganea striata*); b, larva and case; c, larva of *Limnophilus subpunctulatus* removed from case; d, case of same.

moors its tube, and spins silken blinds across the ends. The pupa metamorphosis then begins. At an advanced stage, the pupæ burst their prison, and swim or creep about for a while, before undergoing the final change which lifts them from the

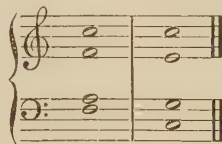
anean and Atlantic coasts, and in 1455, for the Infante Henry, undertook a voyage to the Canaries and as far as the mouth of the Gambia. In 1456 he made a second voyage to Senegambia, and on the death of Prince Henry returned to Venice, where he died about 1480. His account of his discoveries was published at Vicenza in 1507.

Cadenabbia, a health resort, beautifully situated among orange and citron groves, on the west shore of Lake Como. Its famous Villa Carlotta contains works by Canova and Thorwaldsen.

Cadence, in Music, is the close of a phrase; the term being generally applied to the final two chords of the phrase. There are three principal species—viz. the perfect, the imperfect, and the interrupted cadence. The perfect, also called the whole or final cadence, is generally used at the end of a composition or of an important section. Its final chord, either major or minor, must be on the tonic (in the solfa notation, *doh*)—i.e. it must have the key-note for its bass. This is preceded by a major chord on the dominant or fifth note of the scale (*soh*), as for example :



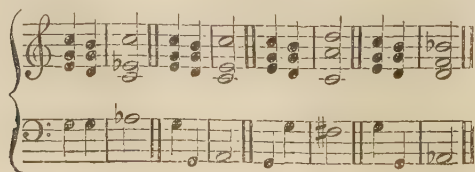
Another form consists of the progression from the chord of the subdominant (*fah*) to that of the tonic, as :



These two forms were formerly distinguished as the authentic and the plagal. The latter differs only as to its place in the scale from the next species, the imperfect or half cadence, which is like a colon or semicolon, for it is used to mark the termination, not of a composition or movement, but of an idea or section. Its harmony is often that of the perfect cadence reversed, as it must end on the dominant chord, which is most frequently preceded by the tonic chord, though sometimes by other chords, such as that of the subdominant (*fah*).



In the interrupted or false cadence the progression of chords is such as to lead to the expectation of a perfect cadence; but instead of the tonic chord, another harmony is unexpectedly introduced, often with strange and beautiful effect. This interruption may be made in so many ways that Reicha, in his *Traité de Haute Composition Musicale*, gives 129 varieties. The following are some of those most generally used :



In modern music, a desire for continuity and freedom from commonplace, has led to the avoidance of full cadences before the conclusion of a piece of music, and to the variation and disguise of them when they do occur. An extreme instance of this may be cited in Wagner's *Tristan und Isolde*, in the whole of which opera there is only one full close—at the end of act i.

Cadency, MARK OF, in Heraldry, an addition to, or variation from, the original coat-armorial of a family, adopted for the purpose of distinguishing a cadet from the head of the house. The term is occasionally restricted to those small figures—the label (1), crescent (2), mullet (3), martlet (4), annulet (5), fleur-de-lis (6), &c.—first introduced



into English heraldry in the reign of Henry VII., used to distinguish the eldest, second, third, fourth, fifth, sixth, &c. sons respectively, and often adopted as hereditary marks of particular junior branches of a family. Other modes of differencing cadets have been and still are used, especially in Scotland, where they form a separate branch of the study of heraldry, which is the subject of a treatise by the Scottish herald, Nisbet. See HERALDRY.

Cadenza, an ornamental flourish introduced by a soloist towards the close of a piece of music or a section of one. It is either written by the composer himself, or left to the executant; and in its more extended development, affords the latter an opportunity of displaying his powers. Remarkable instances of improvised cadenzas by both vocal and instrumental performers are on record, but they are now generally written out in full. The best cadenzas are constructed from themes already heard in the course of the work.

Cader Idris ('Chair of Idris,' a reputed giant), a picturesque mountain in Merionethshire, Wales, 5 miles SW. of Dolgelly. It consists of an immense ridge of broken precipices, 10 miles long, and 1 to 3 miles broad; the highest peak reaching an elevation of 2914 feet. It is composed of basalt, porphyry, and other trap rocks, with beds of slag and pumice. The view from the summit, which is very extensive, includes the Wrekin in Shropshire, and St George's Channel almost to the Irish coast.

Cadet, MILITARY. Cadet (Fr., through some low Lat. diminutive form, from Lat. *caput*, 'head') is a term applied in a general sense to the younger son of a noble house as distinguished from the elder. In Britain and the United States the term is generally applied to a youth studying for the army or navy at one of the military or naval colleges. In Great Britain we have also large numbers of cadets in the officers' training corps (instituted 1907); the contingents of the senior division of the corps consist of students at most of the universities, who are encouraged to qualify for reserve and territorial commissions, while the junior division consists of companies of cadets at a large number of approved schools.

Of British military cadets, those destined for the Royal Artillery or Royal Engineers study at the Royal Military Academy, Woolwich, and those for other branches of the service at the Royal Military College, Sandhurst. Among those who join the latter establishment, some are admitted on passing a qualifying examination, and educated gratuitously. These are sons of officers who have fallen in action, and left their families badly off. They are called 'King's Cadets,' or, if the father belonged to the Indian army, 'India Cadets.'

The East India Company, having its own army, used to pass its cadets through a two-year course at Addiscombe School, but after the transference to the crown of the company's powers in 1861 this system ceased, and officers for the Indian army are now supplied by volunteers from British corps, by direct appointment of cadets from the military colleges, from the special reserve, and from universities that have an approved military class. See ARMY, ARTILLERY, MILITARY SCHOOLS, and COMMISSIONS.

Cadet, NAVAL. All officers for the executive and engineer branches of the navy enter the service as naval cadets under exactly the same conditions, between the ages of 12 and 13; only after the rank of lieutenant has been reached, about the age of 22, are officers distributed amongst the three branches. The result aimed at is that community of knowledge and sentiment which can only be hoped for by early companionship and community of instruction. Cadets, entering the service after examination, are received at the Royal Naval Colleges, where they remain for four years, all receiving the same instruction, including physics and marine engineering and the use of tools and machines, and at the same time such a general education as will enable them to grasp the theory of their future studies, whichever branch they may eventually join. At the end of this period the cadets go to sea in a training cruiser, and are then drafted to the fleet as midshipmen. A direct entry system has also been established for public school boys from 17½ to 18½. They undergo a course of instruction at the Royal Naval College, Keyham, and in the training cruiser, and are then drafted to sea as midshipmen. See MIDSHIPMAN, NAVY.

Cadet's Fuming Liquor. See CACODYL.

Cadi, an Arabic word for a judge or person learned in the law; the title of an inferior judge among the Mohammedan nations. See ULEMA.

Cadillac, a city of Michigan, on a lake 90 miles N. of Grand Rapids, has lumber industries; pop. 10,000.

Cadiz (Sp. *Cádiz*), a great commercial city of Spain, capital of the province of the same name, which forms a part of the great division of Andalusia, is situated at the extremity of a narrow tongue of land projecting 5 miles NW. from the Isle of Leon, 95 miles SSW. of Seville by rail, 7 miles SW. of Xeres (31 by rail). A small channel, with a draw-bridge and a railway bridge, separates the island from the mainland; at its northern outlet stands the arsenal of La Carraca, with large docks, 4 miles ESE. of the city. On the W. and S. the Atlantic Ocean washes the city, and on the N. and NE. the Bay of Cadiz, a deep inlet of the Atlantic, forming an outer and an inner bay. The town, which is walled and defended from the sea both by a series of forts and by low shelving rocks, is about 2 miles in circuit, and presents a remarkably bright appearance, with its shining granite ramparts, and its whitewashed houses crowned with terraces and overhanging turrets. Many of these flat roofs are also used as cisterns, the town being poorly supplied with water, which is brought from Santa Maria, 6 miles to the N. by sea, and 19 by rail. The streets are well paved and lighted, regular, but narrow, and there are some pleasant public walks, the most frequented of which is the Alameda, by the seaside. Cadiz has few public buildings of note: its two cathedrals are indifferent specimens of ecclesiastical architecture, but possess some excellent pictures by Murillo; while the custom-house, naval, and other schools, observatory, signal-tower, alms-houses, hospitals, and bull-ring are distinguished rather for excellent management than for architectural beauty. It reached its highest

prosperity after the discovery of America, when it became the *dépôt* of all the commerce with the New World; declined greatly as a commercial city after the emancipation of the Spanish colonies in South America; again revived, owing to the extension of the Spanish railway system, and to the establishment of new lines of steamers; and again suffered from the loss of Cuba and the preceding wars. Since then the town has directed much of its attention to shipbuilding and manufactures, and improved its port. The exports consist of salt, cork, lead, wine, tunny-fish, olive-oil, and fruits. The manufactures are glass, woollen cloth, leather, soap, hats, gloves, fans, &c. Pop. (1860) 71,521; (1879) 65,028; (1897) 70,177; (1920) 76,818.

Cadiz is one of the most ancient towns in Europe, having been built by the Phœnicians, under the name of Gaddir ('fortress'), about 1100 B.C. It afterwards passed into the hands of the Carthaginians, from whom it was captured by the Romans, who named it Gades, and under them it soon became a city of vast wealth and importance. Occupied afterwards by the Goths and Moors, it was taken by the Spaniards in 1262. In 1587 Drake destroyed the Spanish fleet in the bay; nine years later, Cadiz was pillaged and burned by Essex; and in 1625 and 1702 it was unsuccessfully attacked by the English. From 1808 the headquarters of the Spanish patriots, Cadiz was blockaded by the French from February 1810 until August 25, 1812, when the victories of Wellington forced them to raise the siege. It was captured in 1823 for Ferdinand VII. by the French, who held it till 1828; and it was the birthplace of the Spanish revolution of 1868, as well as the scene in 1873 of an Intransigente rising.

Cadmia is the term applied to the crust formed in zinc furnaces, which contains from 10 to 20 per cent. of cadmium.

Cadmium (sym. Cd, atomic weight 112) is a metal which occurs in zinc ores. In the preparation of zinc, when heat is applied, the cadmium, being more volatile than that metal, rises in vapour, and distils over with the first portions of the metal (see ZINC). It can be got also by electrolysis from cadmium sulphate. It is a white metal, somewhat resembling tin, than which it is rather denser, its specific gravity being 8.6. It is very soft, and is malleable and ductile, crackling like tin when a rod of it is bent. It fuses at 315° C., and volatilises a little below the boiling-point of mercury. There are alloys of cadmium with various other metals. Several of its salts have been serviceable in medicine, and the iodide and bromide have been useful in photography. The sulphide of cadmium, CdS, occurs naturally as the mineral *Greenockite*, and when prepared artificially is of a bright yellow colour. It is known as Cadmium Yellow, and is of great value to the artist. A great variety of tints are produced by mixing it with white-lead. Much of what is sold as Naples Yellow is thus prepared, but the genuine Naples Yellow, prepared by heating antimonious anhydride with plumbic oxide, has a greenish tint. See YELLOW.

Cadmus, in Greek Mythology, the son of Agenor and Telephassa, and brother of Europa. When the latter was carried off by Zeus, he was sent by Agenor in quest of her, with injunctions not to return without her. The search was vain, and the oracle at Delphi told Cadmus to relinquish it, but to follow a cow of a certain kind which he should meet, and build a city where it should lie down. He found the cow in Phocis, followed her to Bœotia, and built there the city of Thebes. Intending to sacrifice the cow to Athena,

he sent some men to the well of Ares hard by for water, but they were killed by the dragon, a son of Ares, who guarded it. Cadmus then slew the dragon, and sowed its teeth in the ground. From these sprang up armed men who slew each other until but five were left, who became the progenitors of the Theban families. To Cadmus (perhaps a Phœnician name) was ascribed the introduction of the Alphabet (q.v.) into Greece.

Cadorna, COUNT LUIGI, born 1850, Italian chief of staff (1914) and commander-in-chief from 1915 to the Caporetto collapse. See his *La Guerra alla Fronte Italiana* (1921).

Cadoudal, GEORGES, a distinguished leader of the Chouans (q.v.), was born near Auray, in Lower Brittany, where his father was a miller, in 1771. He was among the first to take up arms against the Republic, and soon acquired great influence over the peasants. Captured in 1794, he escaped, became leader of the insurgents in Lower Brittany, and organised an army in which no noble was permitted to command, and which Hoche, with all his generalship, was unable to subdue or disperse. After an apparent submission in 1796, he renewed the revolt in Brittany in 1799, but was compelled to submit, and to dismiss his forces, in February 1800. Bonaparte recognised his energy and force of character, and endeavoured to secure his services; but Cadoudal refused his offers, and passed over to England, where the Comte d'Artois appointed him a lieutenant-general, and where, in 1802, he conspired with Pichegru for the overthrow of the First Consul. With this design he went to Paris, but was arrested, condemned, and guillotined, June 25, 1804. He was a man of stern honesty and indomitable resolution. 'His mind was cast in the true mould; in my hands he would have done great things,' said Napoleon of him. After the Restoration, his family was ennobled. It has been held that the British government, or at least some of its members, knew of and abetted his plot to murder Napoleon.

Caduceus, the winged staff of Hermes (Mercury), which gave the god power to fly. Originally a simple olive branch, its stems were afterwards formed into snakes, and several poetical tales devised by the mythologists to explain this, as that Hermes having found two snakes fighting, divided them with his rod, and thus they came to be used as an emblem of peace. It was the staff or mace carried by heralds and ambassadors in time of war. It was not used by the Romans. Many magical virtues were ascribed to the caduceus; in Homer, Hermes touches with it the souls of the dead, and so lulls them to sleep before carrying them to the under-world. It is also seen in the hands of Ares (Mars), Dionysus, Hercules, Demeter, and Aphrodite.



Caduceus.

Cadwalladr, a Welsh prince who, blinded by Irish pirates, resisted Henry II., and died in 1172.

Cadzand, or CADSAND, now a small port of Zeeland in Holland, near the Belgian frontier. It was a great mediæval port; and here in 1337 the English, under Sir Walter Manny and the Earl of Derby, defeated the Flemings in French pay.

Cadzow. See HAMILTON.

Cæcilia (Lat. *cæcus*, 'blind'), a genus of serpent-like amphibians, type of a small order of Gymnophiona, in which the body is worm-like, without tail or limbs, with transversely furrowed skin, and usually with small hidden scales. Their striking serpent-like appearance, suggestive too of the lizard

slow-worm (*Anguis*), is simply an adaptation to similar semi-subterranean habits. The mouth is small, on the under side of the snout; there is an opening with a curious sensory organ beside each nostril; the eyes are not absent nor anatomically incomplete, but small and hidden under the skin; the tympanum and tympanic cavity are absent. Teeth are borne by jaws and gums; the tongue is fixed. The vertebral bodies are biconcave; the skull has two condyles; rudimentary ribs are borne by all the vertebrae except the first and last. Huxley notes that certain peculiarities in the skull are foreshadowed by the extinct giant amphibians or Labyrinthodonts. The cloaca is at the end of the tailless body. Rudimentary limb buds have been observed beside the cloaca. As in snakes, the right lung is much better developed than the left. That they are really amphibians is proved not merely by their anatomy, but by the gills borne by the young forms. In *Ichthyophis* (*Epicrion*) there are three beautiful plumose gills on each side; in *Typhlonectis*, a single pair, which used to be described as sacs, but are really leaf-like. They inhabit warm countries and damp places, burrow like earthworms, and eat worms and insects. About thirty species are known, and are very widely distributed. *Cæcilia* itself is a South American genus, about 20 inches in length, and the thickness of a large worm; *Epicrion* is found in Ceylon, Mexico, and Brazil; and *Siphonops* (over two feet in length) buries deeply in the soft earth of Brazil and elsewhere. The genera, of which 11 altogether are distinguished, are peculiarly divided; thus 5 species of *Dermophis* are American, and one is African. These animals should hardly be called 'blindworms.' It must be clearly recognised that the *Gymnophiona* (*Cæcilia*, &c.) are amphibians, the blindworms or slow-worms (*Anguis*) and the *Amphisbænidae* are lizards, and that all have a superficial adaptive resemblance to snakes.

Cæcilian. See DONATISTS.

Cæcum (Lat. *cæcus*, 'blind'), a general term for any blind sac arising from the gut. Such outgrowths are common in many different classes of animals. The gut being a tube lined by cells in very favourable nutritive conditions, and being at the same time limited in its growth at both ends, it is easy to understand why it should develop outgrowths, or become twisted upon itself in the way it does. Insects and starfishes afford good illustrations of cæca attached to the gut of invertebrate animals. Among backboned animals cæca occur on all the three divisions of the gut. (a) The crop of birds is a more or less marked cæcum or outgrowth of the fore-gut. The stomach itself is frequently, as in many fishes, of the nature of a cæcal sac from the general course of the fore-gut. The complex stomach of ruminants, &c. illustrates the same sort of formation. (b) The digestive cæca at the beginning of the small intestine in many fishes are good examples of outgrowths from the mid-gut. (c) At the union of small and large intestine (hind-gut), cæca are often given off in reptiles, birds, and mammals. Those of birds are usually two in number, and vary greatly from mere papillæ to long tubes. The cæcum of mammals is usually single. It varies greatly with the diet, being short for instance in carnivora, absent altogether in bears and weasels, but long in herbivorous animals. As a hollow sac continuous with the rest of the intestine, it delays the passage of the food, which is thus subjected to longer



Cæcilia compressicauda.

digestion and absorption. In man the cæcum terminates in a small appendage which has not grown in proportion with the rest, and is well known as the appendix vermiformis. Besides the above structures to which the term is often applied (especially to those of the hind-gut), it may be noted that the lungs are outgrowths from the fore-gut, the liver a paired outgrowth from the mid-gut, the allantois an outgrowth from the hind-gut. In their primitive embryonic stages, and in their first appearance—e.g. as air-bladder of fish, hepatic sac of lancelet, bladder of frog—these may be fairly described as cæca. For other information, and for the human cæcum, see DIGESTION, and the other articles named at BOWELS.

Cædmon was the first identifiable English writer of note who used his own language, and the first religious poet of the Teutonic race. All that we know of him is from Bede, who devotes to him a chapter of his *History* (book iv. 24). He died about 680 A.D. In Bede's account, written not more than sixty years after his death, we are told that Cædmon, until he was of mature age, had never learned any poem, and that sometimes when at festivals his turn came to take the harp and sing, he would rise from the feast and go home. On one such occasion, having gone out to the stables of the beasts, which it fell to him that night to guard, and sleeping at his watch, he had a vision, in which one stood by him and said, 'Cædmon, sing me some song!' 'I cannot sing,' he said, 'for this cause I have come out hither from the feast.' 'But you shall sing to me!' 'What,' asked Cædmon, 'ought I to sing?' 'Sing the beginning of created things.' And straightway a poetic inspiration seized him, and he began to pour forth verses in praise of God, of which Bede adds, 'this is the sense, though not the order: "Now ought we to praise the author of the Heavenly Kingdom, the Creator's might and counsel, the works of the Father of Glory; how through the Eternal God he became the author of all wondrous things; Almighty Guardian, who for men's sons created first heaven for their roof, and then the earth."'" When he awoke from his dream, the words remained fast-rooted in his memory, and were recited by him to others with new confidence. He was taken before Hilda, abbess of Streaneshalch (now Whitby), when she and the learned men who were with her in the monastery immediately declared that he had received the gift of song from Heaven. He was now educated, became a monk, and spent the rest of his life in composing poems on the Bible histories and on miscellaneous religious subjects, a long list of which is given by Bede, who says that in all he wrote 'his care was to draw men away from the love of evil deeds, and excite them to the love of well-doing; and that 'none of those who tried after him to make religious poems could vie with Cædmon, for he did not learn the poetic art from men, but from God.'

Of the so-called Cædmonian poems there is extant but a single MS. of the 10th century (Cod. Jun. xi.) in the Bodleian, consisting of 229 folio pages, 212 of which contain the account of the creation and the fall of the angels and of man, and the story of Genesis down to the offering of Isaac, together with a description of the Exodus of Israel, and part of the book of Daniel, ending with Belshazzar's feast; the remaining pages comprise a poem of Christ and Satan—a description of the 'Harrowing of Hell.' It is certain that this poetry, at least in its present form, is due to various authors, and probably to different times. Genesis has been divided by modern scholars into two portions, of which *Genesis B* is an interpolation from an Old Saxon source. Of the Old Testament pieces the critics hold that *Exodus* is the oldest, *Daniel* probably next, *Genesis A* and *B* the latest.

Whether Cædmon wrote any of these is not a question to which any confident answer can yet be given. The MS. was given by Archbishop Ussher to Franciscus Junius, by whom it was printed for the first time at Amsterdam in 1655, twelve years before the first edition of *Paradise Lost*, to some parts of which it bears a striking resemblance. Satan's Speech in Hell is characterised by a simple yet solemn greatness of imagination, which may possibly have influenced in some degree the more magnificent genius of Milton. The beginning of this MS. differs considerably from the English verses given by Alfred in his translation of Bede as the opening of Cædmon's poem, as well as from the Northumbrian version appended to an 8th-century MS. of Bede in the university of Cambridge. Dr George Hickes was the first to doubt the identification of the extant paraphrase with the work of Bede's poet; the elder Disraeli in his *Amenities of Literature* supposes the account of Cædmon's inspiration to be a monkish fiction devised for gain; and the learned Palgrave notes with idle ingenuity (*Archæologia*, xxiv. 342; Lond. 1832) that as the Jews call Genesis (from its first two words) *Bereshith*, and the Chaldee Targum of Onkelos names it *Be-Kadmin* ('in the beginning'), the latter word may be the origin of the name given to the English versifier of Genesis. The fine poem known as *The Dream of the Rood*, part of which in Northumbrian is inscribed in runic letters on the Ruthwell cross, while the remainder was discovered in a MS. at Vercelli, was ascribed to Cædmon by Haigh (1856), and by Stephens (1866), who erroneously read his name upon the topmost stone; but this theory is now abandoned, and the poem generally attributed to Cynewulf (q.v.). Very little was done from Hickes's death in 1715 down to 1830, when the attention of English scholars was again directed to it by Grundtvig. Editions of the Cædmonian poems have been published by Thorpe, with modern Eng. trans. (Lond. 1832); Bouterwek (Elberfeld and Gütersloh, 1851 and 1854); Grein, in his *Bibliothek der angelsächsischen Poesie* (Gött. 1857-64; revised by Wülker, 1894); the *Exodus* and *Daniel*, by T. W. Hunt (Boston, 1883; 2d ed. 1885), and by F. A. Blackburn (Boston, 1907). See Blackburn's introduction and bibliography; also Bernhard ten Brink's *History of English Literature* (vol. i. 1877), Morley's *English Writers* (vol. ii. 1888), Henry Bradley in vol. viii. of *Dict. Nat. Biog.* (1886), Stopford Brooke's histories of early English literature (1892 and 1898), vol. i. of the *Cambridge English Literature* (1907), and Kennedy's prose translation of the poems (1916).

Caen, the chief town in the French department of Calvados, and the former capital of Lower Normandy, is situated on the left bank of the navigable Orne, here joined by the Odon, 9 miles from its mouth, 149 W. by N. of Paris, and 83 ESE. of Cherbourg. It has wide clean streets, a fine central square, with a statue of Louis XIV., charming promenades, and many noble specimens of medieval architecture. Among Caen's churches are those of St Étienne and La Sainte Trinité, both Romanesque in style, founded in 1066 by William the Conqueror and his queen Matilda, and containing their graves, which the Huguenots violated in 1562; St Pierre (1308-1521), with an exquisite spire 242 feet high; St Nicholas, now desecrated; and St Jean. The castle, founded by the Conqueror, and finished by Henry I. of England, was dismantled in 1793, and now serves as a barrack. The university (1809) is successor to one founded by our Henry VI. in 1436; and in the Hôtel de Ville are a library and a fine collection of paintings (its gem Perugino's 'Marriage of the Virgin'). The chief manufacture is lace. Iron ore is exported, coal

imported. A maritime canal connects the port with the sea. Nothing is known of Caen before the 9th century. It was a place of importance in 912, when it came into the possession of the Normans, under whom it increased rapidly. William the Conqueror and his queen made it their residence, and greatly improved it. In 1346, and again in 1417, it was taken by the English, who held it till 1450. In 1793 several of the Girondist chiefs, proscribed by the Jacobins, went to Caen, and organised an unsuccessful revolt against the 'Mountain' (q.v.). Malherbe, Huet, and Auber were natives (a marble statue of the last was unveiled in 1883); Charlotte Corday lived here; and Beau Brummel died in the lunatic asylum. Pop. 54,000.

The excellence of the oolitic Caen Stone from the great quarries here, and the facility of transport by sea, led to its being largely used in England; Winchester and Canterbury Cathedrals, Henry VII.'s Chapel at Westminster, and many country churches are built of it, and it is still in demand in England. See BUILDING STONE.

Cænolestes, a genus of Marsupials (q.v.) comprising two species found in Ecuador and Colombia, small shrew-like animals with a small pouch. With other genera found as fossils in Patagonia, it forms the family Epanorthidae.

Caere. See CERVETRI.

Caergwrie (pron. *Ca-er-goor'leh*), 5 miles NNW. of Wrexham, was one of the Flint boroughs.

Caerlaverock, a splendid ruined castle near the mouth of the Nith, 7 miles SSE. of Dumfries. For more than four centuries the seat of the Maxwells, earls of Nithsdale (1620-1716), and still the property of their representative, Lord Herries, it was captured by Edward I. in 1300. Robert Paterson, Scott's 'Old Mortality,' was buried in the churchyard in 1801. See Sir W. Fraser's *Book of Caerlaverock* (2 vols. 1873).

Caerleon ('castle of the legion'), a small but ancient town in Monmouthshire, on the right bank of the Usk, 2½ miles NE. of Newport. The *Isca Silurum* of the Romans, it was very early the seat of an ancient see—the only one, it seems, in all Wales—which was transferred to St David's in the 6th century. An abbey of Cistercian monks existed here before the Reformation. Many Roman relics have been found, as baths, pavement, altars, tiles, coins, inscriptions, and enamels; and the smaller of these are deposited in a museum. There are also remains of an amphitheatre, measuring 222 by 192 feet, and known as King Arthur's Round Table. Geoffrey of Monmouth it was who connected King Arthur with Caerleon; and to that connection, through Lord Tennyson, Caerleon owes its chief fame. Pop. 2000. See J. E. Lee's *Isca Silurum* (Lond. 1845).

Caermarthen, Caernarvon. See CARMARTHEN, CARNARVON.

Cæsalpinia, a large genus of leguminous trees, the type of the essentially tropical sub-order Cæsalpinieæ (see LEGUMINOSÆ). The sub-order consists largely of trees, among which many are notable for their purgative properties, as *Senna*; some produce edible fruits, as the Tamarind, the Carob, and the West Indian Locust tree; some yield resinous and balsamic products, as *Copaiba*, *Copal* (*Hymenæa* and *Copaiba*); some produce important dye-woods, as Logwood, Brazil-wood; and some are trees of great size, and very valuable for their timber. The genus contains a number of important trees, notably *C. echinata* (*brasiliensis*), which yields the Brazil-wood, Pernambuco Wood; and *C. sappan*, the Sappan-wood of commerce; also *C. coriaria*, which supplies the astringent pods called Dividivi, used in tanning.

The various species named are dealt with in separate articles.

Cæsalpinus, the Latinised form of the name of Andrea Cesalpino, an eminent botanist and physiologist, born at Arezzo, in Tuscany, in 1519. He made his studies at Pisa, afterwards lectured there, and had charge of the botanical museum. He died early in 1603 at Rome. His fame depends on his work, *De Plantis Libri XVI.* (Florence, 1583), which commenced a new epoch in systematic botanical science, and supplied many hints to the great Linnæus. See Sachs, *Geschichte der Botanik*.

Cæsar, the title of the Roman emperors and of the heirs to the throne, was originally the name of a patrician family of the *Julia Gens*, one of the oldest in the Roman state, claiming to be descended from Iulus, the son of Æneas. Octavian bore the name as the adopted son of the great Julius Cæsar, and handed it down to his own adopted son, Tiberius; after whom it was borne by Caligula, Claudius, and Nero. Although the Cæsarian family proper became extinct with Nero, the title of Cæsar was part of the style of the succeeding emperors, usually between Imperator and the personal name, as 'Imperator Cæsar Vespasianus Augustus.' When the emperor Hadrian adopted Ælius Verus (136), the latter was permitted to take the title of Cæsar; and from this time in the western, and afterwards also in the eastern, empire it was borne by the heir-apparent to the throne, while Augustus continued to be the exclusive name of the reigning emperor. It is hardly necessary to mention that the name reappears in the *Czar* or *Tsar* of Russia and of Bulgaria, in the *Kaiser* of the 'Holy Roman Empire' and of the German and Austrian empires, and in the *Kaisar-i-Hind* or emperor of India.

Cæsar, GAIUS JULIUS, son of a Roman prætor of the same name, was born 12th July 100 B.C., according to Mommsen in 102 B.C. His circumstances and connections made him a resolute adherent of the democratic party at Rome. His aunt Julia was wife of Caius Marius; and in 83 B.C. Julius himself was married to Cornelia, daughter of Lucius Cinna, one of the principal enemies of Sulla. The anger of the dictator at this marriage cost Cæsar his rank, property, and almost his life itself. Feeling that he would be safer abroad for a time, he went to Asia, 81 B.C.; but on learning the death of Sulla (78 B.C.), he hurried back to Rome, where he found the popular party in a state of great ferment, and anxious to regain what it had lost under the vigorous despotism of the aristocratic dictator. Cæsar, however, took no part in the attempts of Lepidus to overthrow the oligarchy; but he showed his political leanings by prosecuting (77 B.C.) Cneus Dolabella—a great partisan of Sulla—for extortion in his province of Macedonia. To improve his eloquence, he went to Rhodes to study under the rhetor Apollonius Molo.

In 74 B.C. he returned to Rome, where he had been elected pontifex, and now for the first time threw himself earnestly into public life. He soon became the most active leader of the democratic party, and had a large share in effecting the agreement by which Pompey and Crassus accepted the popular policy. The result was the overthrow of the Sullan constitution in 70 B.C., and the restoration of popular institutions such as the tribunate. In 68 B.C. Cæsar obtained a questorship in Spain. On his return to Rome



(67 B.C.), he married Pompeia, a relative of Pompey, with whom he was daily becoming more intimate. In 65 B.C. he held the curule ædileship, and lavished vast sums of money on games and public buildings, by which he increased his already great popularity. For the next few years Cæsar is found steadily active on the popular side. In 63 B.C. he was elected pontifex maximus, and shortly after, prætor. During the same year occurred the famous debate on the Catiline conspiracy, in which the aristocratic party vainly endeavoured to persuade the consul, Cicero, to include Cæsar in the list of conspirators. It is believed by some that he was at least indirectly concerned in the conspiracy. In 62 B.C. Pompey returned from the East, and disbanded his army. Next year Cæsar obtained the province of Hispania Ulterior. His government of that province was useful to him as giving him military experience and supplying the means wherewith to meet his enormous debts. On his return he was elected consul, along with Calpurnius Bibulus.

With rare tact and sagacity Cæsar reconciled the two most powerful men in Rome, who were then at variance, Pompey and Crassus, and formed an alliance with them, known in history as the *First Triumvirate* (60 B.C.). Cæsar's proceedings during his consulship were marked by this policy of friendship to Pompey; he passed an agrarian law by which Pompey's veteran soldiers chiefly profited, and he obtained the ratification of that general's acts in the East. To strengthen the union which had been formed, Cæsar gave Pompey his daughter Julia in marriage, though she had been promised to Brutus; while he himself also married Calpurnia, daughter of Piso, his successor in the consulship. On the expiry of his term of office, he obtained for himself, by the popular vote, the province of Gallia Cisalpina and Illyricum for five years, to which the senate added—to prevent the popular assembly from doing so—the province of Gallia Transalpina. Nothing could have been more favourable for Cæsar's aims. He had now an opportunity of developing his extraordinary military genius, and of gathering round him an army of veterans, whom perpetual victory should inspire with thorough soldierly fidelity and devotion to his person. This was the very thing he wanted to give him a reputation equal to that of his coadjutors, Pompey and Crassus, whom in genius he far surpassed.

In 58 B.C. Cæsar repaired to his provinces, and during the next nine years conducted those splendid campaigns in Gaul by which he completed the subjugation of the West under the dominion of Rome. In his first campaign he defeated the Helvetii, and also Ariovistus, who with a large number of Germans had settled west of the Rhine. In 57 B.C. Cæsar broke up the Belgic confederacy and subdued the various tribes composing it, the greatest struggle being with the Nervii. When the senate received Cæsar's official despatches, it decreed a thanksgiving of 15 days—an honour never previously granted to any general. During the winter and the spring following Cæsar stayed at Lucca, where he had a memorable meeting with Pompey and Crassus, and for three years following agreed upon a common policy. It was decided that Pompey and Crassus should be consuls for the year 55 B.C., while the government of Cæsar in Gaul was to be prolonged for a second term of five years till 49 B.C. In the year 56 B.C. followed the subjugation of the Veneti and other peoples of Brittany and Normandy, and the conquest of Gaul might be considered complete. He now undertook a fourth campaign against two German tribes who were about to enter Gaul. He was again successful; and pursuing the fleeing

enemy across the Rhine, spent eighteen days in plundering the district inhabited by the Sigambri. In the autumn of the same year (55 B.C.) he invaded Britain; but after a brief stay in the island, returned to Gaul. The Roman senate, astonished at his hardihood and his successes in regions where no Roman army had ever been before, accorded him a public thanksgiving of 20 days. In 54 B.C. Cæsar opened his fifth campaign by a second invasion of Britain, in which he crossed the Thames, and enforced at least the nominal submission of the British tribes in the south-east of the island. On his return to Gaul, Cæsar was compelled—on account of the scarcity of corn—to disperse his forces for winter quarters, and this encouraged some of the Gallic tribes to revolt. It led to the first serious reverse which Cæsar sustained in Gaul; a division of fifteen cohorts was entirely destroyed by the Eburones. But he was speedily master of the insurrection, and exacted a terrible vengeance on its authors. Cæsar now returned to Northern Italy, that he might be able to communicate more easily and securely with his friends at Rome. That city was gradually becoming more anarchic, the evils of weak government more apparent; the hour for decisive action seemed to be approaching, when there broke out a general rebellion of the Gauls, headed by a young warrior of the Arverni named Vercingetorix. It was in the dead of winter when the news came to Cæsar. Without delay he crossed the Cevennes mountains, though they were covered with snow to the depth of six feet. The struggle with Vercingetorix was a severe one; at Gergovia, the capital of the Arverni, Cæsar was defeated, and for a time his affairs seemed in a desperate condition. But he managed to unite his forces, and at the siege of Alesia (52 B.C.) crushed the whole hosts of the Gauls. Vercingetorix surrendered himself, and the independence of Gaul was at an end. Only some isolated tribes continued to resist; and next year (51 B.C.) Cæsar proceeded to quell them. This he successfully accomplished, and having in addition reduced the whole of Aquitania, passed the winter of his eighth campaign at Nemetocenna, in Belgium, where he spent the time in a magnanimous and politic manner. The Gallic princes were courteously and generously treated, and generally a mild system of government was set up, which made the Roman yoke as easy as possible. This was all the more necessary, as affairs at Rome urgently demanded attention. He took up his residence at Ravenna, where he was informed of everything that was going on by the tribune Curio, whose support he had purchased.

In the meantime Pompey had definitely gone over to the senatorial party. Many causes had contributed to this change of attitude. Pompey's wife, Cæsar's daughter Julia, was dead; Crassus had fallen in Asia in 53 B.C., and thus Cæsar and Pompey were left alone, the two most powerful men of Rome. Pompey was jealous of his younger rival. His natural tendency was to adhere to the old aristocratic party. He now cast in his lot with it, and it was decided to break the power of Cæsar. With this view it was necessary to deprive him of his command in Gaul. During the long manœuvring which followed, Cæsar acted with the greatest moderation, and managed to throw upon his opponents the responsibility of violating the law. Under the direction of Pompey the senate summarily called upon him to resign the command and disband his army. The tribunes Mark Antony and Cassius put their veto on this motion; but they were violently driven out of the senate-chamber, and fearing for their lives, they fled to Cæsar's camp. Things had now come to an extremity. The senate intrusted Pompey with the

duty of providing for the safety of the state. His forces far outnumbered Cæsar's legions, but they were scattered over the provinces of the empire, and the Italian levy was unprepared. In face of an enemy of such marvellous promptitude and energy as Julius Cæsar this dilatoriness was fatal. Perceiving that the time for energetic action had at length arrived, Cæsar harangued his victorious troops, who were willing to follow him anywhere; crossed the Rubicon (a small stream which separated his province from Italy Proper), and moved swiftly southwards. Pompey fled to Brundisium, pursued by Cæsar, but contrived to reach Greece in safety, 17th March, 49 B.C. The Italian cities everywhere opened their gates to the conqueror. In three months Cæsar was master of all Italy.

Cæsar next subdued Pompey's legates in Spain, who were at the head of considerable forces. On his return, he took Massilia, where he learned that he had been appointed dictator of the republic—a function which at this time he retained only for eleven days, but these were honourably distinguished by the passing of several humane enactments. Pompey, now thoroughly alive to the magnitude of his danger, had gathered in Egypt, Greece, and the East, a powerful army, while his fleet swept the sea. Cæsar, however, crossing the Adriatic at an unexpected season, made a rush for Dyrrhachium, where Pompey's stores were; but was nevertheless outstripped by his opponent. Pompey entrenched his army on some high ground near the city, where he was besieged by Cæsar. The first encounter was favourable to Pompey, who drove back Cæsar's legions with much loss. The latter now advanced into Thessaly, followed by his exulting enemies. A second battle ensued on the plains of Pharsalia, 9th August, 48 B.C. The senatorial army was utterly routed; and Pompey himself fled to Egypt, where he was murdered. See POMPEY.

No sooner had the news reached Rome, than Cæsar was again appointed dictator for a year, and consul for five years. He was invested with tribunician power for life, and with the right of holding all the magistratral comitia except those for the election of the plebeian tribunes. He did not, however, return to Rome after the battle of Pharsalia, but went to Egypt, then in a distracted condition on account of the disputes regarding the succession. Out of love for Cleopatra (who subsequently bore him a son), he entered upon the 'Alexandrine War,' in which he was successful, and which he brought to a close in March 47 B.C. He next overthrew a son of Mithridates, near Zela, in Pontus, August 2 of the same year, and arrived in Rome in September. He was once more appointed dictator, and the property of Pompey was confiscated and sold. Before the close of the year he had set out for Africa, where his campaign against the Pompeian generals, Scipio and Cato, was crowned with victory at the battle of Thapsus, April 6, 46 B.C. Cato committed suicide at Utica, and with such irresistible celerity was the work of subjugation carried on, that by the end of the summer Cæsar was once more in Rome. Now occurred that display of noble and wise generosity for which Cæsar may be regarded as truly great. He was not a man that could stoop to the vulgar atrocities of Marius or Sulla; he majestically declared that henceforth he had no enemies, that he would make no difference between Pompeians and Cæsarians. His victories in Gaul, Egypt, Pontus, and Africa were celebrated by four great triumphs, during which the whole Roman populace was feasted and fêted by the magnificent liberality of the dictator.

Cæsar now proceeded with his schemes for the settlement of affairs at Rome. During the year 46 B.C. he conferred a benefit on Rome and on the

world by the reformation of the calendar, which had been greatly abused by the pontifical college for political purposes. After quelling an insurrection which broke out in Spain, where Pompey's sons, Cneius and Sextus, had collected an army, he received the title of 'Father of his Country,' and also of *imperator*, was made dictator and *præfectus morum* for life, and consul for ten years; his person was declared sacred, and even divine; he obtained a body-guard of knights and senators; his statue was placed in the temples; his portrait was struck on coins; the month Quintilis was called Julius in his honour; and on all public occasions he was permitted to wear the triumphal robe. He proposed to make a digest of the whole Roman law for public use, to found libraries for the same purpose, to drain the Pontine Marshes, to enlarge the harbour of Ostia, to dig a canal through the Isthmus of Corinth, and to quell the inroads of the barbarians on the eastern frontiers; but in the midst of these vast designs he was cut off by assassination on the Ides (15th) of March, 44 B.C. Of the sixty aristocrats who were in the conspiracy, many had partaken of Cæsar's generosity, and all of his clemency. A few, like Brutus, out of a weak and formal conscientiousness, based on theory rather than insight, were probably offended by Cæsar's desire to change the form of government into a hereditary monarchy; but the most, like Cassius, were inspired by very ordinary motives.

Cæsar, who was fifty-six years of age when he was murdered, was of a noble and kingly presence, tall of stature, with a countenance which, though pale and thin with thought, was always animated by the light of his black eyes. He was bald-headed (at least in the latter part of his life), wore no beard, and though of a rather delicate constitution naturally, he ultimately attained to the most vigorous health. In the completeness and variety of endowments he has had no equal. Both as general and statesman he takes a foremost place in the annals of the world; and excepting Cicero, he was the greatest orator of his time. As a historian, he has never been surpassed and rarely equalled in simplicity and in the terse directness and dignity of his style. He was, in addition, a mathematician, philologist, jurist, and architect, and always took great pleasure in literary society. The importance of Julius Cæsar in history depends chiefly on the work he did in the transformation of the Roman state from a republic to the rule of a single chief. The republican government of Rome was intended for a city with a limited population of burgesses and dependents. As its rule widened, this form of government proved more and more inadequate to the altered circumstances. Under the new conditions due unity and energy in the administration could be attained only through the rule of a single chief resting ultimately on the military power. During the anarchy of the later republic this was becoming apparent. Cæsar saw it with greater clearness than any of his contemporaries, and he had the genius and energy to bring it almost to realisation. His policy was on the whole the same as that more cautiously pursued by Augustus, to concentrate in his person the chief offices of state, and thus to establish a single rule under the old republican forms. Such a transformation was inevitable; and Cæsar, in the course he followed, simply brought the tendencies of the time to their own proper development. He was a realist statesman who worked towards attainable ends by such means as were available. Yet he showed a clemency and generosity of temper, a humanity and serene superiority to the mean and vulgar passions of the time, that in a moral point of view decidedly raise him above the level of his contemporaries.

Of Cæsar's works the Commentaries on the Gallic and Civil wars alone have been preserved. See Mommsen's *Roman History* (Eng. trans. 1866), and Drumann's *Geschichte Roms*; the works of Merivale and Arnold; *Histoire de Cæsar*, by Napoleon III.; Froude's *Cæsar*; Stoffel, *Histoire de Jules Cæsar* (1888); W. W. Fowler, *Julius Cæsar and the Foundation of the Roman Imperial System* (1892); Col. T. G. Dodge, *Cæsar* (1893); T. Rice Holmes, *Cæsar's Conquest of Gaul* (2d ed. 1911).

Cæsar, SIR JULIUS, judge, born at Tottenham in 1558, was the son of Cesare Adelmare, physician to Queen Mary. He was called to the bar in 1580, and was appointed judge of the Admiralty Court in 1584, Chancellor of the Exchequer in 1606, and Master of the Rolls in 1614. He sat in six parliaments, was knighted in 1603, and died 18th April 1636. The close friend of Whitgift, and afterwards of Bacon, he has left a higher reputation for superiority to bribery than for legal acumen; and his lavish bounty to all beggars is related to have rendered the loan of his coach, so well known to this fraternity, an expensive favour for his friends. He wrote two treatises, on the Court of Requests and on the Privy-council, and a multitude of miscellaneous papers.

Cæsare'a (now *Kaisariyeh*), in the vilayet of Angora, has played an important part in the history of Asia Minor. On the great trade route from the Black Sea coast to the Euphrates, and on the Roman road from Ephesus to the east, it is still an important commercial centre (pop. 50,000). It was a Hittite capital and, as Mazaca, capital of the kings of Cappadocia; was taken by the Armenians; and when it had 400,000 inhabitants (260 A.D.) destroyed by the Persians. St Basil was bishop here.—**CÆSAREA PALESTINA**, once a splendid seaport on the coast of Palestine, 30 miles N. of Joppa, was built by Herod about 22 B.C., and named in honour of Cæsar Augustus. It was a Greek town, with temples, amphitheatre, baths, and a well-protected harbour. It was the see of Eusebius in the 4th century, and here the Crusaders built a cathedral. Amidst its ruins are a few miserable houses inhabited by fishermen.—**CÆSAREA PHILIPPI** was situated about 95 miles N. of Jerusalem, near the source of the Jordan. Its suffix was given in honour of Philip the Tetrarch, who repaired the city. The modern village of Paneas, or Baniyas, stands on its ruins. It has been identified with Baalgad or Beth-Rehob.

Cæsarean Operation has from very ancient times been the popular name for *Hysterotomy*. Pliny distinctly alludes to it in his *Natural History* (lib. vii. cap. ix.), saying that the first of the Cæsars was so called from being taken by excision out of the womb of his mother. It is often stated that Julius Cæsar came into the world in this way—a very doubtful story—and that the operation took its name from him. Tradition ascribes to Numa Pompilius a decree that every pregnant woman who died should be opened. The church council at Durham in 1220 laid down the conditions under which the operation was justifiable; and the Senate of Venice in 1608 decreed that practitioners should perform, under heavy penalties, the Cæsarean operation on pregnant women supposed to be dead. In 1749 the king of the Two Sicilies decreed the punishment of death to medical men who omitted to perform it on women dying when advanced in pregnancy. Of course, to be of any use, it must be performed immediately.

In the case of a living woman the risk to the child's life is slight, but to the mother's very great indeed. Still, many cases are on record where not only the child but the mother was saved. Some women, indeed, seem to have accepted it as their usual method of delivery, having several children, each requiring to be removed through an

abdominal incision; one woman submitted to it seven times. It has also been successfully performed in most unfavourable circumstances. An illiterate Irish midwife operated with a razor on a poor farmer's wife in 1738, removing a dead child, and her patient completely recovered; and cases are known in which women have operated on themselves with perfect success. The operation has been less often and less successfully resorted to in Great Britain than on the Continent and in America.

Since about 1870 various procedures have been introduced with a view to diminishing the risk to the mother when natural delivery is impossible. In Thomas's operation (1870) the skin incision is made in the groin, and the genital canal is opened into below the uterus, which is left intact. Porro's operation, first performed by him in 1876, consists in the removal of the uterus after the child has been delivered. Both these operations are improvements on the old procedure, in which the first incision was made in the middle line of the body. Suturing of the uterus and the use of antiseptics have greatly reduced mortality.

Cæsarion, or **PTOLEMY** (B.C. 47–30), son of Cleopatra and (it is supposed) of Julius Cæsar, was nominally joint ruler with his mother. After her death Augustus had him murdered.

Cæsium, an alkaline metal, almost always found along with rubidium, was discovered by Bunsen and Kirchhoff in 1860 by spectrum analysis. The metal, isolated for the first time in 1882, is silver white, soft and extensible, and like rubidium is highly analogous to potassium. Its symbol is Cs, and its atomic weight 132.9. Its melting-point is 26.5° C., and its specific gravity 1.88. It ignites spontaneously in the air, and when thrown on water behaves like sodium, potassium, and rubidium. The name is derived from *cæsius*, 'sky-coloured,' from the colour given to the blowpipe flame by cæsium. See **RUBIDIUM**.

Cæsura, in prosody, is a pause in the line, on whose varying position much of the rhythmical effect of verse depends; in classical prosody cæsura is the division of a word between two feet.

Café. See **COFFEE-HOUSES**.

Caffeine, or **THEÏNE**, $C_8H_{10}N_4O_2.H_2O$, is the alkaloid or active principle of Coffee (q.v.) and Tea (q.v.). When isolated, it forms beautiful white crystals, with a silky lustre, which are soluble in chloroform, water, alcohol, and ether. It is a remarkable fact that nearly all the beverages in use in different parts of the world owe their virtues to, or at least contain, the same or similar active principles. Thus caffeine is present in coffee, tea, guarana, Paraguay tea or *maté*, and in the kola nut; while in cocoa theobromine is the corresponding principle, differing but slightly from caffeine in chemical composition—the latter being methyl-theobromine—i.e. theobromine in which one atom of hydrogen has been replaced by the group methyl, CH_3 . In coffee, caffeine is present to the extent of from 1 to 2 per cent., while ordinary tea and guarana contain from $2\frac{1}{2}$ to 6 per cent. In large doses, caffeine proves fatal to the lower animals, causing convulsions and death. In man, doses of 8 to 12 grains produce diuresis, great excitement, anxiety, and even delirium; but it has been of late used medicinally as a stimulant of the heart and nerves. It may be extracted from coffee or tea by making a decoction in hot water, and adding acetate of lead, which causes a precipitate of caffeotannate of lead. When the latter is acted on by sulphuretted hydrogen, the lead is separated, and the caffeine left in solution. On evaporation of the liquid, and recrystallisation from alcohol, the caffeine separates in crystals.

Caffeine forms a series of salts, of which the

citrate has come largely into use. One grain given every hour is often found to give great relief in sick headaches.

Caffraria. See KAFFRARIA.

Cage-birds. Birds have been kept from the earliest history of the world to the present time by savage as well as by civilised races, and the origin of caging and domesticating birds as pets is lost in antiquity. Alexander the Great kept a ring-necked parakeet in a golden cage of fabulous value; and these birds still bear the name of the famous Greek emperor. Steam and colonisation have led to the regular importation into Britain of many thousands of foreign cage-birds every year, and as many of these varieties breed freely in England, our native songsters are less sought after as pets except by the poorer class. Not that any of these brilliantly plumaged foreigners can compare in song with several of our more sober-coated little songsters—the British blackbird, the thrush, or the skylark. There is now a craze for foreign bird-breeding, and Australian and American parakeets nestle freely in large cages or garden aviaries, burrowing into logs of rotten wood, making no nests, and laying their eggs in the holes. They stand our winters well if supplied with abundance of suitable food—viz. canary, hemp, millet, and oats for aviaries; and canary only in cages, where want of exercise produces excessive fatness and egg-binding. Of the foreign cage-birds, the best songsters are the shama (*Copsychus macrura*, an Indian bird of the thrush family), bulbul, Virginian nightingale (of which the hen sings quite as well as the male bird), and the American mocking-bird. Amongst English soft-billed songsters the most desirable are the nightingale, blackcap, blackbird, thrush, lark, and starling; these all have to be fed on crushed hemp and bread-crumbs, with animal food in the shape of meat or insects—spiders being a wonderful ‘pick-me-up’ for these birds when out of health. Of the grain-eating British birds kept for their song, linnets and goldfinches head the list; but the bullfinch is deservedly popular, for he is very handsome in his crimson breast and black velvet coat, and he is essentially of a knowing, jolly disposition, although his call-note is somewhat monotonous. He can easily be taught to whistle a tune if the lesson is begun before he is old enough to be in full song. Siskins and redpolls are the unfortunate birds which a certain class of people delight to chain to a bucket-board by means of a belt or brace, and doom to draw their water and food from wells beneath by means of miniature buckets. Goldfinches and linnets are sometimes similarly treated, but happily this cruel practice—like the ‘blearing’ of birds’ eyes with a hot iron to make them sing better—is rightly discontinued.

Broadly speaking, the ailments which afflict all cage-birds are in ninety-nine cases out of a hundred due to injudicious and excessive feeding, and it is far better to err on the side of short commons than to feed too high. As the sicknesses of the birds owe their origin to insufficient exercise and too much stimulating food, the safest and most universal medicine is a drop of castor-oil, put into the patient’s mouth with a camel-hair brush. Artificially heated rooms and the fumes of gas are very deleterious to bird-life, and glass conservatories, by reason of their varying heat, are unsuitable places either for aviaries or cages. To hang a bird in a window, or to place an aviary cage there, is gross cruelty, because a draught is even more injurious to birds than to human beings; and pets kept under such conditions are always in bad health and wheezy.

The best parrot for talking purposes is the double-fronted, yellow-faced Amazon (*Chrysotis ochro-*

cephala), which is much harder than the African gray birds, of which latter species more than ninety-five per cent. die in the process of acclimatisation. There are two varieties of grays—small from the south coast, and a larger kind from the west of Africa; these latter are the best. The spring of the year is the proper season to buy a parrot, as the young birds are then imported, and there is the whole summer and autumn in which to harden them off. The cockatoo family are all crested, and in some varieties the crests are fan-shaped, and can be opened or closed at will. These birds make noisy cage-pets, being querulous and excitable, and they never make good talkers. Canary-seed is the best staple article of diet for all the parrot tribe, both large and small.

Cagliari (pronounced *Cal'yari*), the capital of Sardinia, at the head of a spacious bay, on the south coast of the island. By steamboat it is 34 hours from Leghorn, 27 from Naples, 22 from Palermo, and 17 from Tunis; whilst by rail it is 174 miles S. of Porto Torres. With a lagoon on either hand, it lies at the base and on the slopes of a steep hill, 300 feet high; its streets are mostly narrow and dirty. Its harbour, defended by forts, has been enlarged since 1882; and Cagliari has a university (1596; remodelled 1764), a castle (*circa* 1217), a cathedral (1312; modernised 1703), and a bronze statue (1860) of Charles Felix V. Population, 61,000. Cagliari occupies the site of the *Carales* of the Carthaginians, and has a Roman amphitheatre, measuring 95½ by 79 yards. From 19 A.D. till 1492 it was the seat of a great Jewish colony; otherwise it has shared the ups and downs of Sardinia, having been several times besieged or bombarded—in 1708 by the English under Admiral Lake.

Cagliari, PAOLO. See VERONESE.

Cagliostro, COUNT ALESSANDRO DI, an arch-impostor, who, in the latter half of the 18th century, travelled through Europe, and whose adventures afford considerable insight into the men and manners of his times. He was born at Palermo, of poor parentage, 8th June 1743, and his true name was Giuseppe Balsamo. Carlyle’s picture of him when a boy—‘brass-faced, vociferous, voracious’—is probably accurate, and already prophecies the bold and boisterous quack. When thirteen years old he ran away from school, and was afterwards sent to the monastery of Caltagirone. Here he became assistant to the apothecary, and picked up that scanty knowledge of chemistry and medicine which he afterwards turned to such profitable account. His conduct in the monastery was in keeping with his character, but finding it too contracted a sphere for the development of his ambitious genius, he left it, or was ejected, and for a time led ‘the loosest life’ in Palermo. In 1769 he found it advisable to leave his birthplace; and in company with the Greek sage Althotas, he is vaguely represented as travelling in parts of Greece, Egypt, and Asia. At Rome, ‘his swart, squat figure first becomes authentically visible in the Corso and Campo Vaccino. He lodges at the sign of the Sun in the Rotunda, and sells etchings there,’ very hard up at this time. At Rome, too, ‘the bull-necked forger’ contrived to marry a very pretty woman named Lorenza Feliciani, who became a skilful accomplice in his schemes, and captivated many admirers, while Cagliostro picked their pockets. He now made the tour of Italy with great success as a physician, philosopher, alchemist, freemason, necromancer. Next, he extended his vicious career through some parts of Germany, and especially carried on a lively business in his ‘elixir of immortal youth,’ which became very popular among the laaies. By its virtue the count assured them he had already attained his

150th year, while his young and charming wife often talked affectionately of her son as 'a commander in the Dutch navy.' Through Courland, they advanced triumphantly to the court of St Petersburg, where he seems to have made his first failure; for the Empress Catharine, aided by her Scots physician, Rogerson—a keen-witted native of Annandale, who sceptically examined his famous 'Spagiric food,' and pronounced it 'unfit for a dog'—penetrated his real character, and made him the subject of a comedy. Cagliostro soon found it convenient to vanish. We next find him at Warsaw, discoursing on his pet Egyptian masonry, medical philosophy, and the ignorance of doctors, but he has the misfortune to be unmasked by a certain Count M. This, however, had little effect on the stupid credulity of Cagliostro's dupes—belonging, it must be remembered, to the upper classes, who in that age were at once sensual, infidel, and superstitious—so that they persisted for a time 'in distending his pockets with ducats and diamonds,' which, however, his lavish dissipation soon scattered to the winds—for this prophet of a new physical and moral regeneration, and inventor of an 'invaluable pentagon for abolishing original sin,' was a desperate gambler. In 1780 he went to Strasbourg; and soon afterwards we find him in Paris, still founding lodges of 'Egyptian freemasons,' holding nocturnal meetings for the evocation of spirits, and scandalously simulating the character and deeds of a philanthropist. From Paris he came over to England, where he was cordially received by the followers of Swedenborg. On his return to Paris (1785), he became distinguished at court, was intimate with the weak and credulous Cardinal Rohan, and played a prominent part in the affair of the Diamond Necklace (q.v.). This lodged him in the Bastille; but he cleared himself by a statement which gained credit, and, after being liberated, carried on his adventures once more in England, but feebly, the sunshine of success now obviously growing dim; in short, the count, in gloom and foreboding, disappeared from the island. On the Continent, too, the market was closed, a general distrust having been excited by the revelations of one of his dupes. 'At Aix, in Savoy, there are baths, but no gudgeons in them;' at Turin he is ordered off by the king; a similar fate befalls him at Roveredo; at Trent we catch a glimpse of him 'painting a new hieroglyphic screen,' which, however, attracts no more the gaping crowd; lower still, 'he pawns diamond buckles;' finally, his wayworn wife 'longs to be in Rome by her mother's hearth.' In May 1789 he entered the city; on the 20th December he was imprisoned by the Inquisition, and condemned to death for freemasonry. His sentence was commuted to imprisonment for life in the fortress of San Leone, where he died 26th August 1795. His *Mémoires* (Paris, 1785) are not authentic. See the essay (1833) in Carlyle's *Miscellanies*.

The above is the ordinarily received account, made familiar by Carlyle's *Miscellanies*. But it should be added the evidence for identifying Cagliostro with Balsamo is slender and some think quite insufficient; we do not certainly know the history of Cagliostro, who probably used hypnotic suggestion as well as pure charlatanism, till he appears under his own name in London in 1776. Nor is it proved that he died or was murdered in the 'dried-up cistern' or dungeon of San Leone in 1795; some believe that he escaped and lived some years in Russia. See Trowbridge's *Cagliostro* (1910).

Cagnola, LUIGI, MARQUIS (1762–1833), an architect, born at Milan. A follower of Palladio, he belonged to the revivers of classical architecture.

Cagots (Basque *Agotac*), a name given to a distinct tribe of people, who are found scattered in the district of the western Pyrenees. Formerly

they were usually said to be the descendants of the Visigoths, who remained in France after their defeat by Clovis in the 5th century, and the name was explained as a corruption of *canis gothus* ('Gothic dog'). But it is difficult to understand why such a descent should have maintained its opprobrium. Others have connected them with the Albigenses, or the Moors left behind in Gascony after the disaster at Tours; it is far more likely that they were originally the victims of social seclusion due to the taint of leprosy, but that the disease wore itself out from their healthy way of life. M. de Rochas has strengthened this argument by showing how easily *Cagueux*, the ordinary name applied to the same or a similar people in Brittany, is formed from the Celto-Breton word *cacodd*, 'leprous.' Until the French Revolution they were forced to wear a peculiar dress, were forbidden to practise all but the most menial trades, though M. P. Raymond has shown that in the 14th and 15th centuries some were even bankers and physicians, and were obliged to live isolated, either in separate villages or in separate quarters of the towns. So complete was their estrangement from the other inhabitants, that they were forced to enter the churches by doors specially set apart for them. Since that Revolution, they have been placed, as regards the law, on an equal footing with other citizens, but socially they are still regarded as a degraded race. In their language there is nothing that is distinctive, save that their isolation has sometimes made them speak a purer dialect than their neighbours, nor yet are they ethnologically distinct; although many have claimed that the predominant blue eyes, fair hair, and fair complexion point back to a Teutonic origin. They have been often connected erroneously with the *Cretins*, with whom their healthy frames, and strong but not unhandsome figures, have little in common. Races, whose history and present condition greatly resemble those of the Cagots of south-western France, are called *Cagueux* in Brittany, and *Colliberts* in Poitou, Maine, and Anjou. See Michel, *Histoire des Races Maudites de la France et de l'Espagne* (2 vols. 1847); the bulletins of the *Société Anthropologique* (1871, &c.); Rochas, *Les Parias de France et d'Espagne, Cagots et Bohémiens* (1877); and Dr J. Hack Tuke in vol. ix. (1880) of the *Journal of the Anthropological Institute*.

Ca'hir, a town in County Tipperary, Ireland, beautifully situated on the Suir, 11 miles NW. of Clonmel. On a rock in the river is Cahir Castle, built in the 12th century. The town has a large trade in corn and flour. Pop. 2000.

Cahors (anciently *Divona*), the chief town in the department of Lot, in the south of France, is situated on a small rocky peninsula, formed by a bend of the river Lot, 71 miles north of Toulouse by rail. The streets are steep and narrow, and present many fine specimens of antique architecture. The cathedral was built early in the 12th century. Cahors contains many Roman remains, including those of a magnificent aqueduct. The famous Fénélon was a student at the university here, which was founded by Pope John XXII. in 1321, but united with that of Toulouse in 1751; and here were born the poet Clément Marot, and Léon Gambetta to whom a monument was raised in 1884. The town was taken and pillaged by Henry of Navarre in 1580. Its industries are pottery and tanning; it has also an active trade in truffles, oil, wine (a dark-red Pontac), walnuts, plums, wool, and lime. Pop. 13,000.

Caicos, a group of islands belonging geographically to the Bahamas, but annexed in 1874 to Jamaica. The North, West, East, Grand, and

other Caicos have, together with Turks Islands, an area of 165 sq. m., and a population of 5600. Salt, conchs, sisal, sponges are their chief products.

Caifa. See HAIFA.

Cailliaud, FRÉDÉRIC, a French traveller, born at Nantes, 9th June 1787, became a goldsmith and travelled over Europe, and in 1815 to Alexandria. In examining the mineral resources of Egypt, he rediscovered the ancient emerald mines of Jebel Zobara, near the Red Sea; and his report of a journey to Siwah (see OASES) led to its annexation by Egypt in 1820. In 1821-22 he accompanied Ibrahim Pasha's expedition to the White Nile, and his *Voyage à Méréô* (4 vols. Paris, 1823-26) contained the first reliable information of that district. In 1827 he settled as conservator of the Natural History Museum at Nantes, where he died, 1st May 1869. He published a *Voyage à Syouah* and two volumes of researches on the life of the ancient Egyptians, Nubians, and Ethiopians.

Caillié, RENÉ or AUGUSTE, a French traveller, noted for his journey to Timbuktu, was born 19th September 1799 at Mauzé, in Poitou. Having gone to Senegal, and engaged in trading with the natives, he learned about 1826 that the Geographical Society of Paris had offered a premium of 10,000 francs to the first traveller who should reach Timbuktu. Provided with a stock of goods for barter, and dressed in Moorish garb, Caillié, who had learned Arabic, started from Kakondy in Sierra Leone, April 18, 1827, and after some delay caused by illness, reached the mysterious city, April 20, 1828. Here he remained fourteen days, then accompanied a caravan across the Sahara Desert, reaching the coast at Tangier, August 7. After hearing and examining his statements, the society awarded him the offered prize, with a pension of 1000 francs. His notes of travel, arranged by M. Jomard, were published under the title *Journal d'un Voyage à Tombouctou*, &c. (3 vols. 1830). Caillié died near Paris, May 7, 1839.

Cain, the first-born of Adam and Eve, appears in the book of Genesis as the prototype of human weakness descending swiftly into inhuman wickedness, and Cain and his family are contrasted with the husbandman Abel as the founders of settled life and worldly culture. A sect of the Ophite Gnostics, called *Cainites* (130 A.D.), believed that Cain was the offspring of the intercourse of a superior Power with Eve, and Abel of an inferior Power; that their characters corresponded to their paternal parentage, and that the slaying of Abel only symbolised the victory of the superior over the inferior Power. See Gnostics, OPHITES.

Caine, SIR THOMAS HENRY HALL, was born (of Manx blood on his father's side) at Runcorn in Cheshire, on the 14th May 1853, and was trained as an architect, but gradually passed to journalism (on the *Liverpool Mercury*) and literature. He published *Recollections of his friend Rossetti* (1882), *Sonnets of Three Centuries* (1882), and *Cobuebs of Criticism* (1883); but is best known by his novels, *The Shadow of a Crime* (1885), *A Son of Hagar* (1886), *The Deemster* (1887), *The Bondman* (1890), *The Scapegoat* (a story of Morocco, where he travelled, 1891), *The Manxman* (1894), *The Christian* (1898), *The Eternal City* (1901), *The Prodigal Son* (1904), *The White Prophet* (1909), *The Woman Thou Gavest Me* (1913), *The Master of Man* (1921). Some have been dramatised—*The Deemster* as *Ben-my-Chree* (1889). Of his plays, *Mahomet* was withheld from the stage at the Turkish ambassador's request. He promoted the international copyright movement.

Ca'ing Whale. See CAIING WHALE.

Cainozoic. See TERTIARY, GEOLOGY.

Ca ira ('It will go on!'), a popular song which arose in the fever of the French Revolution, so named from its refrain:

Ah! ça ira, ça ira, ça ira!
Les aristocrates à la lanterne!

Like the *Marseillaise*, the *Carmagnole*, and the *Chant du Départ*, it became a French national song, and was styled the *Carillon National*. The words, which are worthless rubbish enough, were due to a street singer named Ladré; the melody to Bécourt, a stage-drummer. The song was prohibited by the Directory in 1797.

Caird, SIR JAMES, born at Stranraer, in Wigtownshire, in 1816, published in 1849 a treatise on *High Farming as the Best Substitute for Protection*, and among later works, *English Agriculture in 1850-51* (1852), a reprint of letters to the *Times*, which has been translated into German, French, and Swedish, and republished in the United States. He sat in parliament as a Liberal, 1857-65, and in 1864 obtained a grant for the collection and publication of agricultural statistics of the country. Appointed chairman of the Royal Commission on Sea Fisheries in 1863, he was made a K.C.B. in 1882. He died 9th February 1892.

Caird, JOHN, a great Scottish preacher, was born at Greenock in 1820. He studied at the university of Glasgow, and held in succession pastoral charges at Newton-upon-Ayr (1845), Lady Yester's parish, Edinburgh (1847), Errol, in Perthshire (1849), and Park Church, Glasgow (1857). A sermon preached before the Queen at Crathie in 1855, and published under the title of *Religion in Common Life*, quickly carried the fame of the author into all parts of the Protestant world. Dean Stanley said it was the greatest single sermon of the century. In 1858 Caird published a volume of sermons, marked by beauty of language, strong thought, and intense sympathy with the spiritual aspirations of mankind. He received the degree of D.D. in 1860, was appointed professor of Divinity in 1862, and in 1873 Principal of Glasgow University. In 1880 he published a (Neo-Hegelian) *Introduction to the Philosophy of Religion*, and in 1888 a small work on Spinoza. He died 30th July 1898.—His brother, EDWARD, born 22d March 1835, from Glasgow passed as a Snell exhibitioner to Balliol College, Oxford, and became in 1864 fellow and tutor at Merton. In 1866 he was appointed professor of Moral Philosophy at Glasgow University, where he exercised unusual personal influence over his students; and from 1893 till his resignation in 1907 he was Master of Balliol. Among his works are a *Critical Account of the Philosophy of Kant* (1877), an excellent little book on Hegel, an examination of *The Social Philosophy and Religion of Comte* (1885), and the St Andrews Gifford Lectures on *The Evolution of Religion* (1893). He died in 1908. See Jones and Muirhead, *Life and Philosophy*.

Cairn, or CARN, a Celtic word signifying a protuberance, a heap, a pile, appears in names of hills and rocks in Scotland, Ireland, Wales, Cornwall, and Brittany; but in archaeology, 'cairns' are artificial heaps of unhewn stones. Externally all cairns are very much alike, the only differences discernible being those of size and basal outline. Internally they vary in their construction according to their purpose and period. Prehistoric cairns are usually sepulchral, but any dry-built structure, such as a broch, a bee-hive house, or even an early Christian church in a condition of ruin, may assume the appearance of a cairn. Sepulchral cairns of the prehistoric period are divisible into two classes—chambered and unchambered—the former being characteristic of the stone age, the latter of the age of bronze and later times. The chambered cairn may be circular,

oval, or oblong on the ground-plan, sometimes with concave or convex ends. The passage, roofed with flat stones, leads into a chamber which may either have a roof of Bee-hive (q.v.) construction as in the British Isles, or of megalithic construction of immense blocks laid from wall to wall as in Brittany and Scandinavia. The chamber is sometimes subdivided by partitions of slabs set on edge in the floor, at other times there are smaller chambers opening off three sides of the main chamber, the fourth side being occupied by the entrance-passage, as at Maeshowe in Orkney. Both burnt and unburnt human remains are found in these chambered cairns, which seem to have been family sepulchres used for long periods consecutively. They are often of great size, and conspicuously placed on eminences, or associated in groups as tribal cemeteries like those of Tailten, Cruachan, and Brugh, so often referred to in the early Irish annals as 'the three cemeteries of the idolaters.' The external configuration of the cairn is usually defined by a single or double retaining wall, and the site is sometimes surrounded by a ditch, or by a ditch and rampart of earth, as at Maeshowe; or by a single or double circle of standing stones, as at Clava in Strathnairn; or it may be associated with an alignment, or group of standing stones arranged in rows, as at Callernish in the island of Lewis. The chamber is always small in comparison with the vast size of the cairn itself. In Caithness an oblong cairn 240 feet in length had a chamber measuring only 12 feet by 6. Maeshowe (a circular cairn covered with earth), 92 feet in diameter and 36 feet in height, has a chamber measuring only 15 feet by 14 feet 10 inches, entered through a passage 54 feet in length. Gavr Innis in the Morbihan, 197 feet in diameter and 30 feet high, has a chamber measuring only 9 feet by 8, entered through a passage 44 feet in length. In this case both passage and chamber are lined with great stones elaborately sculptured with groups or patterns of irregularly circular, spiral, and wavy lines. In a cemetery of about 30 cairns at Loughcrew, in Ireland, there are several of 120 to 180 feet in diameter, the chambers of which are lined with sculptured slabs of somewhat similar character. The great chambered cairn of New Grange, one of a group of three situated on the banks of the Boyne, near Drogheda, with a diameter of 315 feet and a height of about 70 feet, has a chamber of about 13 feet diameter, with side recesses of smaller size. The passage is 63 feet in length, and many of the great stones lining the passage and chamber are sculptured with incised patterns of irregular spirals and zigzags. The site of the cairn is surrounded by a circle of standing stones. It is on record that these cairns were opened and plundered by the Norsemen in 862 A.D. The unchambered cairns of the bronze age and later times are usually smaller in size and mostly circular. Instead of a passage and chamber they contain in their interior, sometimes on, sometimes under the surface level, one or more burials, burnt or unburnt, inclosed in cists formed of unhewn flat slabs. There is in the church of Penmachno, in Wales, an early Christian monument which states that 'Carausius lies here, in this cairn of stones,' 'Carausius hic jacit in hoc congeries lapidum' (sic). Adamnan in his life of St Columba mentions that a converted chief in Skye was buried by his followers under a cairn. There is an old Gaelic proverb, *Cuiridh mi clach 'ad charn*, 'I will add a stone to your cairn,' and in the north-west Highlands it was the custom to erect cairns of stones at the halting-places on the journey to the cemetery. Cairns, apart from their original purpose, have been used as boundaries, or as the meeting-places of tribes, or the inauguration-places

of chiefs. The *Cairn-na-cuimhne*, near Balmoral, was the mustering-place of the men of Strathdee. Occasionally a cairn may be raised to commemorate some event, or to mark a spot traditionally connected with a deed of fame or of horror. A familiar instance of the latter class is found in Musket's Cairn in the King's Park, Edinburgh, where a wife was murdered by her husband in 1720 (see Scott's *Heart of Midlothian*); to the former belong the Jubilee cairn on Ben Ledi, and the numerous cairns round Balmoral. Cairns are most frequent in stony countries. Where stones are scarce, the earthen mound or Barrow (q.v.) came in place of the cairn, from which it differs only in the materials. See CALLERNISH, MAESHOWE.

Cairnes, JOHN ELLIOT, economist, was born in County Louth, Ireland, 26th December 1823. His father was a brewer, and as the son showed no aptitude for such learning as his teachers offered him, he was placed in the brewery. After a time, however, young Cairnes began to entertain a liking for intellectual pursuits, and, much against his father's will, went to Trinity College, Dublin, where he graduated B.A. in 1848. In 1856 he was appointed Whately professor of Political Economy at Dublin, the first-fruits of this office being his *Character and Logical Method of Political Economy* (1857). In 1859 he was elected to the chair of Political Economy and Jurisprudence in Queen's College, Galway. He published in 1862 his book on the *Slave Power*, which made a profound impression. In 1866 he was called to the chair of Political Economy in University College, London. He published his *Essays on Political Economy, Theoretical and Applied* in 1873, and in 1874 *Some Leading Principles of Political Economy newly Expounded*. An accident in the hunting-field in 1860 led to a breakdown in health, from which he never quite recovered, and the later years of his life were clouded with suffering, which he bore with patience, nor did it prevent him taking a lively interest in the affairs of the day. He died 8th July 1875. As an economist, Cairnes may be regarded as a disciple of Mill, but his adhesion was that of a powerful and independent thinker, whose opinions were the result of his own research. He elucidated with great clearness, grasp, and philosophic comprehensiveness many of the most important and difficult problems in political economy. He maintained the doctrine of the 'Wages Fund' after Mill had himself abandoned it.

Cairngorm, or more fully CAIRNGORM STONE, a name often given by jewellers, particularly in Scotland, to brown or yellow quartz or rock-crystal, because found among the Cairngorm Mountains, in south-west Aberdeenshire. The same mineral is found in many other localities, as at Olivet near Orleans, in Bohemia, Brazil, Siberia, &c. In Cairngorm and the neighbouring district of Mar, it occurs both in the granite rock and in the alluvial soil. It differs from common colourless quartz or rock-crystal only in the presence of a very little oxide of iron or manganese, to which it owes its colour. It is much used as an ornamental stone. The yellow variety is not unfrequently called topaz, although quite different from the true topaz, which it resembles chiefly in colour, having neither its hardness nor its brilliancy. The topaz is, however, sometimes found along with it in the granite and gneiss districts of Mar and Cairngorm. The brown variety is sometimes called Smoky Quartz, and when of a good and uniform colour is by some preferred to the yellow.

Cairngorms, a Scottish mountain group on the borders of the counties of Inverness, Banff, and Aberdeen, and of the basins of the Spey, Don, and

Dee, includes the highest summits (except Ben Nevis) in the British Islands—Ben Macdui (4290 feet), Braeriach (4248), Cairntoul (4241), and Cairngorm (4084).

Cairns, on Trinity Bay, in northern Queensland, the port of the Atherton and Evelyn (timber and agriculture), Herberton (tin-mining), Irvinebank (tin), and Chillagoe and Etheridge (gold, silver-lead, and copper) districts, promised to become the most productive area in Queensland. The district produces sugar. At Kamerunga, 9 miles away, is the State experimental farm for tropical and semi-tropical products. Pop. 7500.

Cairns, EARL. HUGH MACCALMONT CAIRNS, a great lawyer and parliamentary debater, was born in County Down, Ireland, in 1819, and educated at Trinity College, Dublin. He was called to the bar at the Middle Temple in 1844, was returned to parliament for Belfast in 1852, and quickly made his mark in the House by his fluency and readiness in debate. He became Q.C. in 1856, in 1858 Solicitor-general, and in 1866 Attorney-general under Lord Derby. Later in the same year he was made a judge of appeal, and in 1867 was created Baron Cairns. Under Disraeli's premiership he became Lord Chancellor in 1868, and again in 1874, and was created Earl Cairns in 1878. For some years he led the Conservatives in the House of Lords, and was a zealous philanthropist. He died 2d April 1885.

Cairns, JOHN (1818-92), born at Ayton Law, Berwickshire, studied at Edinburgh, was minister at Berwick in 1845-76, and was professor of theology and principal of the United Presbyterian seminary. He wrote on philosophy and theology, and a memoir of Dr John Brown. See *Life* by Macewen (1895).

Cairo, the capital of modern Egypt, lies on the right bank of the Nile, near the apex of the Delta, in N. lat. 30° 3', E. long. 30° 21', by rail 129 miles south of Alexandria, and 48 miles west of Ismailia on the Suez Canal. It is the largest and most populous city in Africa. In 1882 its population was 374,838, in 1907, 654,476 (including the suburbs and Helwān), and in 1917, 790,939; whilst the European element, consisting largely of Italians, Greeks, and Levantines, rose from about 21,000 in 1882 to 46,507 in 1907. The majority of the inhabitants are of mixed Arab and Egyptian race; but there are large numbers of Copts, Turks, Syrians, Armenians, Jews, and negroes. The principal growth of the city during the past century has been to the west, covering what was the bed of the Nile up to the 13th century; and the contrast between the historical and the almost European parts is sharply drawn by a line running north and south, a little to the east of the Ezbekiyya Square. Suburbs have arisen on the north-east ('Abbasiya, now chiefly military), and are in process of extending far afield, as at Heliopolis. The medieval city, however, stands characteristic and apart, and the various stages of its expansion can still be traced. It is built upon the vestiges of four distinct foundations. Before the Arab conquest, in 641, there was a town (perhaps a northerly suburb of Memphis) known as Babylon, and here was a Roman fortress (now called Kasr-esh-Shema', and notable for its mixed contents, which include five Coptic churches, two Greek, and a Jewish synagogue). On its submission, 'Amr, the Mohammedan general, began to build a town for his Arab army on the site of his camp, close to the fortress, and in this military settlement, which was named El-Fustât (a word which Arabic lexicons interpret by 'tent,' but which may be a corruption of *fossatum*, an 'earth-work'), he built his mosque, still standing, though frequently altered and enlarged. What is popularly called 'Old Cairo,' properly Misr-el-'Atika,

stands partly on the site of Fustât, the rest of which lies buried under sand-drifts. When the 'Abbâsid khalifs supplanted the Omayyads in 751, an official suburb, El-'Askar ('the Camp'), sprang up round the new governor's residence, to the north-east of Fustât; and in 870 Ahmad-ibn-Tûlûn, the first virtually independent Mohammedan ruler of Egypt, shifted the seat of government another step north-east, by founding El-Katâi' ('the Fiefs') for his battalions, whose quarters were ranged round about his splendid new palace and his famous mosque, which still stands, in great decrepitude, as evidence of the early use of the pointed arch in so-called Arab architecture. Yet another extension to the north-east took place in 969, when Gôhar, the general who conquered Egypt for the Fâtimid (Shi'a) khalifs of Tunis, laid the foundations of the great palace-enclosure which he named El-Kâhira ('the Victorious'), whence the Italian form Cairo. In the present day the whole city is commonly called Masr, or Masr-el-Kâhira (Masr, correctly Misr, is also the Arabic name of Egypt itself), though Masr originally meant that part of the city which was not included in the Fâtimid royal faubourg. El-Kâhira, however, gradually joined on to the older quarters, and the various separate towns or suburbs grew into one city. The Fâtimid walls, still visible in places, or traced by the names of gates, such as Bâb Zuweyla in the heart of Cairo, were greatly extended by Saladin so as to include his Citadel, which was founded in 1176 on a spur of the Mukattam hills, to the east of Ibn-Tûlûn's old quarter; and Saladin's wall still forms the eastern limit of Cairo.

The majority of the buildings, however, which form the characteristic features of the medieval city belong to the period of the Mamelukes (Mamlûks) and the Turks who succeeded them. It may still be seen in much of its former picturesqueness in the space extending roughly between the Bâben-Nâsr ('Gate of Victory') and the Citadel, including most of the old Fâtimid faubourg. Here are still the narrow, crowded, winding streets; the cupboard-like shops; the great enclosed *kham*s or warehouse-markets; the streets or quarters, occupied each by a distinct trade (or nationality), and formerly shut off by great gates, of which few remain; the skeletons of huge palaces and mansions of the later Mamelukes; the quiet, residential lanes, with upper stories overhanging, and sometimes still furnished with the lattice-windows termed *meshrebiyyas*; the decorative street-fountains and ornate and tiled school-houses; and, above all, the splendid series of mosques, in which the development of Saracenic architecture may be traced in its purest expression from the 10th to the 16th century. From the mosque of El-Hâkim (990), which stands beside the Gate of Victory, to that of El-Ghûri (1503), and between these dates, those of Kala'ûn (1288), his son En-Nâsir (1298), Sultân Hasan (1358), in front of the Citadel, the history of a rare and vanished art is revealed. Neglect and vandalism, natural decay, and the greed of the travelling collector have irrevocably injured the sacred and secular monuments of Cairene art; but since 1882 the Committee for the Preservation of the Monuments of Arab Art, aided by government grants, has worked hard to save what remained, and has not only maintained in more or less stable condition the great majority of the monuments which it found menaced with destruction, but has spent many thousands of pounds in restoring a few typical mosques to their original state, as far as this can be reproduced by the highly skilled staff of the committee. The protection of ancient buildings has become highly efficient. The Museum of Arab Art in its new building, opened in 1903, with a library (containing a fine collection of Arabic

MSS.), testifies to the interest now taken in the art of the Saracens.

Cairo has passed through many political phases. From 641 to 969 it was a provincial capital under the Eastern khalifate, with intervals of virtual independence. From 969 to 1174 it was the capital of the Shi'a Fātimid khalifs. It was the seat of an orthodox Moslem kingdom from Saladin's time to the fall of the Mamlūk sultans in 1517. After that it relapsed into the provincialism of a pashalik. In 1798 the French occupied it, to be evicted by the English in 1801. In 1811 Mohammed 'Alī Pasha once more restored it to practical independence. From 1882 it was protected by a British army. In 1922 it became capital of a kingdom.

The invasion of medieval Cairo by western ugliness is seen chiefly in the Shāri' Mohammed 'Alī, a broad, straight street, lined by shops and offices, connecting the Citadel with the modern part of the city, and by the electric tramways which run in the broader thoroughfares and have utilised the bed of the old canal (El-Khalīg), filled up in 1897. But for the most part the European Cairo is distinct from the Oriental, and occupies ground to the west of it. Here, round the Ezbekiyya, and between it and the Nile, are the chief hotels (which are thronged by Western visitors in the winter and spring), the government offices, opera-house, post-office, banks, churches, consulates, international law-courts, and the large residential quarters of Ismailiyya and Tewfikiyya, consisting of modern villas of the Italian kind, usually let in flats, and standing in gardens, ranged along broad avenues planted with trees. A little farther south is 'Abdīn, the principal palace of the king, where official receptions are held. Other palaces stand on the bank of the Nile, where are also the chief hospitals, barracks, and the Egyptian Museum, originally housed at Būlāk, removed to a palace at Gezira in 1889, and brought back to its handsome building near the great bridge of Kasr-en-Nil in 1902.

Beyond Būlāk (q.v.), the Nile-port of Cairo, which rose out of the river's bed only in the 14th century, is the island of Gezira, formed about the same time, which has been converted into the playground of Cairo. There are a large hotel (once a khedivial palace), polo-ground, race-course, tennis-courts, and all the apparatus of a gymkhana. A little farther south is the ancient island of Er-Rōda, with remains of a medieval mosque and palace, but chiefly celebrated for its 9th-century Nilometer, a square well for measuring the rise of the river in days before scientific damming. Helwān, 14 miles south of Cairo, in the desert (opposite the site of Memphis), connected by rail, may be regarded almost as a suburb; its hotels and villas attract numerous visitors and patients, who benefit by its sulphur springs and pure desert air.

In the essentials, and also the luxuries, of modern life Cairo is well supplied. The Egyptian schools have made considerable progress; there are various higher, technical, and scientific colleges; and a movement is on foot to supplement the old system of the Azhar, the medieval (970) university mosque, by a 'national' university. The Azhar itself is a most interesting survival of obsolete Moslem scholasticism. In 1901 there were 251 'professors' and 10,403 students, and in 1914, 405 teachers and 9749 students, more than all the undergraduates of Oxford and Cambridge combined. Commercially there is not much doing in Cairo except in the import and transport trade; for the old arts and industries of Egypt have dwindled or vanished. Rude pottery, turned woodwork, silversmiths' work, silk, leather, and paper-making are the chief remaining manufactures. The great influx of Europeans has improved the shops, and of course implies a large custom. Rail and tele-

graph connect the capital with Alexandria, Port Said, Ismailia, Suez, and the Sudan.

See Stanley Lane-Poole, *Cairo* (Medieval Towns; 1902); E. W. Lane, *Cairo Fifty Years Ago* (1896); E. A. Reynolds-Ball, *Cairo* (1898); Ravaisse, *Topographie du Caire* (1887); Makrizi, *Topographie* (French trans. by Bouriant, in progress).

Cairo, capital of Alexander county, Illinois, on a low point of land at the junction of the Ohio with the Mississippi, about 180 miles below St Louis, is an important centre of railway and steamboat traffic. A steel bridge (1888) connects the railways north and south of the Ohio. The city has suffered much from inundations, from which it is now protected by levées, utilised for streets and railway tracks. Some of these burst in 1912. There are numerous factories, a convent, an academy, a United States marine hospital, and a custom-house. Pop. 15,000.

Caisson, in engineering construction, is a chest used in 'laying' the foundations of the piers of bridges, quays, and like structures, in deep and rapid rivers. It consists of a very strong platform of timber or of metal plates, to which the sides are attached. The site of the pier being levelled by dredging or otherwise, the caisson is brought over the spot, and moored in the proper position. Two or three of the lower courses of masonry are then built upon the platform of the caisson, and the water is slowly admitted by a sluice, in order to cause the caisson to settle into its place.

When the foundations are laid with concrete, the caisson may consist of a simple frame of wooden walls, floated into position to form an enclosure, into which the concrete can be shot, and can set undisturbed by the wash of the water. Compressed air is now very generally employed inside a metal column, in a chamber at the bottom of the column, where workmen are required for excavating. The column is open at the bottom, and the water is prevented from occupying the working chamber by the counterpressure of the air. Communication between the working chamber and the external atmosphere above is effected by means of what is aptly called an 'Air-lock' (q.v.), serving for the exit and entrance of the workmen and materials. The air in the lock is lowered to the pressure of the atmosphere before the chamber is opened for the passage of men or materials to the open air; and it is, on the contrary, raised to the pressure of the air in the working chamber before men and materials are admitted.

In excavating for the foundations of the Forth Bridge, the caissons were of very large dimensions, being 70 feet in diameter, the greatest depth reached varying from 71 feet to 89 feet below high-water, and from 39 feet to 43 feet into the bed of the Forth. The pneumatic process was in the main adopted (see BRIDGE).

The second and more substantial Tay viaduct (see DUNDEE) has main spans of 245 feet, each pier carrying which is formed of two iron cylinders, 23 feet in diameter, filled with brickwork and concrete, and sunk to depths varying from 20 feet to 30 feet into and resting upon sand, the depth of water at high-tide being 23 feet. The weight borne by each superficial foot in the cylinders is estimated at 3 tons.

The bridge over the Ganges at Benares, with spans of 335 feet, has piers composed of single iron caissons of oval shape, 65 feet long, 28 feet broad, lined with brickwork and filled with concrete. They are sunk to a depth of about 100 feet.

One of the most remarkable instances of the sinking of foundations by means of iron caissons was exhibited in the erection of a graving-dock at Toulon. Here the caisson was 472 feet long by 134 feet wide, and 62 feet deep. It embraced the

entire dock, which was built of masonry. The excavation was performed by the use of a compressed-air chamber in the bottom of the caisson, as in the Forth Bridge.

Caisson, in relation to shipping, is an apparatus for lifting a vessel out of the water for repairs or inspection. It is usually a hollow structure, sunk by letting water into it. There is an air-chamber inside, which allows it to sink only to a certain depth. In that state it is hauled under the ship's bottom, the traps or openings are closed, the water is pumped out, and the caisson rises with the ship upon it. *Pontoon* is another term for the same apparatus.—The name caisson is also given to the pontoon or floating gate used to close a dry-dock or similar place.

Caithness, a county in the extreme N. of the Scottish mainland. Its length from N.E. to S.W. is 43 miles; its greatest breadth, 28 miles; and its area, 700 sq. m. Except in the west and south, where the mountain-range dividing Caithness from Sutherland attains in Morven a height of 2313 feet, the general aspect of Caithness is level and bare, being in great part moorland and treeless. The northern sea-coast is bold and rocky, with many bays, inlets, promontories, and caves. Here are Dunnet Head and Duncansby Head; and on the west side of the last-named is John o' Groat's House (q.v.). There are no navigable rivers in Caithness, and no lakes of importance. The climate is damp and chilly, but snow rarely lies on the plains above a day or two at a time. Thunder is rare; auroras are seen almost nightly in winter. The common fuel is peat. The chief crops are oats, bere, turnips, and potatoes; but only a fourth of the area is in cultivation. The parts which are under tillage have generally a deep fertile loam on a strong till clay. In the north-east the soil is sandy. The crops are twenty days later in ripening than in the Lothians. The occupants of many of the small farms divide their time between farming and fishing. There are herring, ling, cod, salmon, and lobster fisheries. The herring-fishery falls in July and August, and Wick is a chief seat of the British herring-fishery. The other exports are cattle, oats, wool, and flagstones. The county, with Sutherland, returns one member to parliament. Till 1918 Wick was a parliamentary burgh; Thurso is a police burgh, an old burgh of barony. Pop. (1801) 22,609; (1861) 41,111; (1881) 38,865; (1911) 32,010; (1921) 28,284. In early times Caithness is supposed to have been inhabited by Celts, who afterwards mixed with Danes and Norwegians; and from the 10th century to 1196 it was subject to Scandinavian jarls. The Scandinavian origin or part-origin of the people of Caithness is shown by their tall forms and fair features, and their speaking English instead of Gaelic. Caithness has remains of brochs and several old castles. See Laing's *Prehistoric Remains* (1866), Calder's *History* (new ed. 1887), and the Ancient Monuments Commission's *Report* (1912).

CAITHNESS FLAGSTONES are thin-bedded, dark-coloured bituminous sandstones, slightly micaceous and calcareous, valuable on account of their great toughness and durability for pavements, cisterns, and various other purposes, and accordingly are largely exported. They belong to the Old Red Sandstone (q.v.), and contain abundant remains of fossil fishes.

Caius, DR JOHN, physician and scholar, was born at Norwich in 1510. (Caius, pronounced *Keys*, is a Latinised form of the English name *Kayes* or *Keys*.) He entered Gonville Hall, Cambridge, in 1529, and in 1533 was elected a fellow thereof, having just before been appointed principal of Fiswick's Hostel. In 1539 he went abroad, in 1541 was created an M.D. of Padua; returning

to England in 1544, he delivered lectures on anatomy in London, then practised at Shrewsbury and Norwich. In 1547 he was admitted a fellow of the College of Physicians, of which he was subsequently nine times elected president. He also became physician to Edward VI., Queen Mary, and Queen Elizabeth. In 1557 he obtained permission to elevate Gonville Hall into a college, which took the name of Gonville and Caius College, and of which in 1559 he became master. A loyal Catholic, he had great trouble with his Protestant fellows, who burned his mass vestments, and whom in return he put in the stocks. He died 29th July 1573. He was author of *A Booke or Counsell against the Sweatyng Sicknesse* (1552), and of other works (collected, with life, in 1912) on subjects critical, antiquarian, and scientific.

Caivano, a town of Italy, 4 miles N. of Naples, manufactures glass and casks; pop. over 12,000.

Cajamarca, a department in the NW. of Peru, between the western chain of the Andes and the Amazon. A railway connects it with the Pacific, and there is a large farming and cattle-raising industry. Area, 12,500 sq. m.; pop. about 450,000. The capital is Cajamarca; pop. 12,000.

Cajeput, or CAJUPUT (*Melaleuca leucodendron* or *minor*), a tree of the order Myrtaceæ, from the leaves of which the pungent, aromatic, volatile oil called Oil of Cajeput is obtained by distillation. It ranges from Australia to the Philippines and the Malay Peninsula. It is rather a small tree, with a crooked trunk, thick spongy bark, white wood, elliptical-lanceolate alternate evergreen leaves, and terminal spikes of white flowers. The greater number of the species are natives of Australia, some of them very beautiful shrubs and frequent in hothouses. The tree is known in Australia as Swamp Tea-tree or Paper Bark, the name 'cajeput' being given only to the oil.

Cajetan, CARDINAL, properly Thomas de Vio, was born at Gaeta in 1469. At an early age he entered the Dominican order, lectured on theology at Brescia and Pavia, and became general of his order in 1508, cardinal in 1517, Bishop of Gaeta in 1519, and legate to Hungary in 1523. In the history of the Reformation, his name is remembered for his vain attempt to induce Luther to recant his errors at Augsburg in 1518. He was prepared to make concessions to the Reformers. Cajetan died at Rome in 1534. His *Opera Omnia* were printed in 5 vols. at Lyons in 1639.

Calabar, or OLD CALABAR, is a coast district of Upper Guinea, constituting the south-eastern province of Nigeria (q.v.), extending from the Nun mouth of the Niger eastwards. The principal river is the Cross River, which, navigable for about 200 miles, unites with the Old Calabar River and two smaller rivers to form the Old Calabar estuary. The chief towns are Old Calabar (Duke Town), seat of government of the protectorate, on the estuary, about 40 miles from the sea; Creek Town; and Fish Town. Palm oil and kernels, rubber, various woods and gums, ivory, and hides are the chief products, and nurseries for supplying rubber seedlings have been established. Missionary enterprise has been very active, and there has been a Presbyterian mission since 1846. The Efik is the principal of the various tribes, which were all more or less cannibal. Many books have been issued in their language, Efik. Education, formerly in the hands of the missions, has been taken up by the government, which has established a system of primary and secondary schools, and a High School with a large staff.—NEW CALABAR is a district between Brass and Bonny, in the Calabar province. It has a trade centre in the town of New Calabar at the mouth of

the New Calabar River, the most easterly of the mouths of the Niger (q.v.).

Calabar Bean, or the ordeal bean of Old Calabar, is the seed of *Physostigma venenosum*, of the order Leguminosae. It is a climber nearly allied to the scarlet runner, but reaches a height of 50 feet or more, and is perennial, with a slender woody stem. It yields its virtues to alcohol, and imperfectly to water. It is used in the form of an emulsion by the natives of Africa, as an ordeal when persons are suspected of witchcraft, the accused being declared innocent if he can throw off the poison by vomiting. In 1855 Sir Robert Christison very nearly fell a victim to his zeal for science in experimenting with this bean, dangerous symptoms having been produced by 12 grains of the kernel which he swallowed. In 1861 Sir T. R. Fraser tried the effects upon himself of doses of 6, 8, and 10 grains. The general symptoms were epigastric uneasiness, great feebleness, dimness of vision, salivation, giddiness, and irregular, feeble, and slow heart-action. About the same time he



Calabar Bean :
a, flowering branch ; b, seed-pod ; c, seeds.

made the interesting discovery that, when placed on the eyeball, this substance contracts the pupil, and produces near-sightedness ; and it is now frequently employed for these purposes in ophthalmic surgery. It has also been administered in tetanus and other nervous diseases. Fraser has also shown that since its action is precisely contrary to that of belladonna or its active alkaloid atropine, the latter can with certainty be administered (even in quantities which would be injurious or fatal under ordinary circumstances) as an antidote. However, if a large quantity has been taken, then the effect of the atropine increases the poisoning, with fatal results. The Calabar bean owes its activity to the presence of a very powerful alkaloid, called physostigmine or eserine, which, in the form of discs containing $\frac{1}{1000}$ th grain of physostigmine sulphate, is much used in ophthalmic operations. It is of use after injuries to the cornea ; it stimulates the iris and ciliary muscle ; it reduces intra-ocular pressure, and contracts the pupil.

Calabash Tree (*Crescentia cujete*), a small tree belonging to the Bignoniaceae (q.v.), common in tropical America and the West Indies. The wood of the tree is tough and flexible, and useful for coach-making ; but by far the most useful part is the hard shell of the fruit, which, under the name of *calabash*, is much used in place of bottles for holding liquids, and for goblets, cups, water-cans, &c.,

and in fact furnishes most of the domestic utensils of the natives. These shells may even be used as kettles for boiling liquids, and they will bear this several times without being destroyed. They are sometimes polished, carved, and dyed, and otherwise ornamented. The rinds of gourds are sometimes similarly used, and called calabashes.

Calabria, the south-west peninsula of the kingdom of Italy. The area is 5800 miles, the population a million and a half. It is traversed all its length of 160 miles by the Apennines, whose summits in the region in the north, known as La Sila, and the Aspromonte in the south, are crowned with pines, while forests of oak, beech, and chestnut cover their sides. The valleys between the various hills afford rich pasture, especially in the north, to which, where swamps have not rendered them uninhabitable from malaria, whole colonies migrate in spring-time with their flocks and herds. There is no river of any importance in Calabria ; but the valleys and plains, watered by such streams as there are, are very fertile, yielding wheat, rice, cotton, liquorice, saffron, sugar-cane, vine, orange, lemon, olive, fig, and mulberry in luxuriance. Iron, tin, lead, silver, alabaster, marble, and graphite are among its minerals. The fisheries of its coasts, particularly the tunny and anchovy fisheries, are important. The district is very subject to earthquakes, as in the awful visitations of 1905 and 1908. The compartimento of Calabria is divided into the provinces of Cosenza, Catanzaro, and Reggio (see ITALY). In ancient times the name Calabria was given to the south-east peninsula, nearly corresponding to the modern province of Lecce, no portion of which is included in modern Calabria, which answers to the ancient *Bruttium*. The name, as now applied, appears to have originated with the Byzantines sometime prior to the conquest of the country by the Normans in the 11th century. The people, proud, fiery, and revengeful, were long celebrated as among the fiercest of banditti. They strenuously resisted the power of France during the Napoleonic campaigns, and were not finally subdued until 1810.—*Il Calabrese* ('the Calabrian') is the name by which the painter Maltia Preti (1613–57) is usually known. See Norman Douglas, *Old Calabria* (1915).

Calad'ium. See COCCO.

Calahorra, a town of Spain, 30 miles SE. of Logroño by rail. It occupies the site of the ancient *Calagurris*, the birthplace of Quintilian, celebrated for its obstinate but unsuccessful resistance to Pompey's legate (78 B.C.). It has an old cathedral, and 10,000 inhabitants.

Calais, a seaport of France, in the department of Pas-de-Calais, on the Strait of Dover, here 21 miles wide, by rail is 184 miles N. of Paris. It ranks as a fortress of the first class, the old walls, dividing it from its suburb, Saint Pierre, having been demolished since 1883, and their place supplied by a ring of exterior forts. The gate built by Richelieu in 1635, and immortalised by Hogarth, has disappeared ; but the cardinal's citadel (1641) still stands on the west of the town. On the south and east are low marshy grounds, which could be submerged in the event of an invasion. The harbour, which was nearly dry at low-tide, was greatly improved during the last quarter of the 19th century. Calais is one of the chief ferry-ports for England. With the air of a Flemish more than of a French town, Calais has not much to boast of in the way of objects of interest. The church of Notre Dame has a fine 'Assumption' by Seghers. The picturesque hôtel-de-ville was rebuilt in 1750, and restored in 1867. The adjoining Tour de Guet (1214) served as a lighthouse till 1848 ; the present

lighthouse is 190 feet high. A museum (1884) occupies the site of the Hôtel Dessin, where Sterne lodged, and Scott, and Lady Hamilton. A handsome English church was built in 1862. The chief manufacture is tulle or bobbin-net, introduced by English from Nottingham in 1818. The fisheries, once important, have greatly declined. Pop. (1872) 39,700; (1881) 44,315; (1921) 73,001. See HARBOUR.

Calais was a small fishing-village till, in 997, it was improved by Baldwin IV., Count of Flanders, whilst in 1224 it was enlarged and strengthened by Philip of France, Count of Boulogne. In 1347, after a twelvemonth's siege, it was captured by Edward III. of England, and the self-devotion then shown by six of the citizens is commemorated by a monument by Rodin. The English retained it until 1558, when it was captured by the Duke of Guise, its garrison of 800 men holding it for a week against his 30,000. Since then (with the exception of two years, 1596-98, when it was in the possession of the Spaniards) Calais has continued French. Charles II. of England resided some time there; and James II. arrived with French troops for the invasion of England, which the destruction of the French fleet prevented him from accomplishing. Louis XVIII. landed at Calais in 1814, after his exile.

Calais, a city of Maine, 82 miles ENE. of Bangor, at the head of navigation of the St Croix River, on the Canadian boundary, has some ship-building and a large lumber trade; pop. 6000.

Calamander Wood, a cabinet-wood of the greatest value, resembling rosewood, but much surpassing it in beauty and durability. The tree which produces it is *Diospyros hirsuta*, a species of the same genus which produces ebony and the persimmon; it grows in SE. India and Ceylon. But this tree 'has been so prodigally felled, first by the Dutch, and afterwards by the English, without any precautions for planting or production, that it has at last become exceedingly rare.' It yields veneers of unusual beauty, 'dark wavings and blotches, almost black, being gracefully disposed over a delicate fawn-coloured ground.' Its density is very great, a cubic foot weighing nearly 60 lb., and it takes an exquisite polish. The name is supposed to be a corruption of Coromandel Wood.

Calamary, or **SQUID**, a popular name applied to numerous forms of Cuttle-fish or Cephalopoda (q. v.), but more especially to the common *Loligo vulgaris*. The genus belongs to a family known as Myopsidæ, including Cephalopoda with ten arms, a horny (except in *Sepia*) pen, the remnant of a shell, and a cornea closing the eye. The body is long, pointed behind, and bears two triangular posterior fins. The skin round the mouth bears suckers; the two longest seizing-arms bear four or more rows of suckers, and are not entirely retractile; one of the shorter arms becomes much modified in the male to form a 'hectocotylus' or sperm-

holding organ. About two dozen species of *Loligo* are known from all seas, and some fossil forms

occur in the Jurassic strata. The Common Calamary (*Loligo vulgaris*) has a pinkish or yellowish white colour, with purplish-brown spots, and measures a foot and a half or more in length, not including the arms. It is common in the Atlantic and Mediterranean, swims actively in shoals, and is sometimes eaten, or used as bait. For further details, see CUTTLE-FISH.

Calambac. See ALOES-WOOD.

Calamine, an ore consisting essentially of carbonate of zinc. Its primary form is a rhomboid, and it occurs in small obtuse-edged crystals; usually, however, it is compact and massive, often assuming botryoidal forms. It is white, yellowish-white, brown, green, or gray; is sometimes opaque, sometimes translucent; is brittle, and has an uneven conchoidal fracture. It occurs in beds and veins in rocks of various kinds, but most commonly in limestone. Mendip, Matlock, Alston Moor, Leadhills, and Wanlockhead are British localities. Calamine is an important ore of zinc.—The silicate of zinc—hemimorphite—is by some mineralogists called Calamine.

Calamint (*Calamintha*), a genus of Labiatae, nearly allied to balm and thyme. *C. officinalis* is not infrequent in England. It has an agreeable aromatic mint-like odour, is used by the country-people to make herb-tea, and enjoys a widespread traditional repute as a pectoral medicine. *C. clinopodium* is Wild Basil, and *C. acinos* Basil Thyme. The common calamint is found in North America, with several native species.

Calamis, an Athenian sculptor of the first half of the 5th century B.C.

Calamites, a group of fossil plants which make their first appearance in the Devonian, occur abundantly in the Carboniferous, and seem to die out in the Permian strata. There is little doubt as to the true affinities of these plants—they are most probably related to the Equisetaceæ, and are believed to be a kind of gigantic 'horse-tails.' The stem had a soft inner pith, surrounded by a ring of wood, and an external bark. The well-known fossil, with its longitudinal ribs and furrows, replaces the central pith, and thus yields a cast of the inner surface of the woody zone. The ribs and furrows are transversely jointed at intervals—these intervals sometimes increasing or decreasing regularly, or in other cases being equal or irregularly different in length. (In one series the longitudinal furrows of the pith-casts do not alternate at the joints or nodes, and these fossils are now separated from Calamites proper under the genus of Archæocalamites.) In some stems long narrow branchlets proceed from the transverse joints, and in others branches bearing whorls of small branchlets or long narrow pointed leaves. The branch-scars occur periodically, the node-bearing scars being separated from each other by a certain number of joints without branches. The root termination is conical. Some of the species were provided with thick, and others with thin, bark. Calamites seem to have grown in dense brakes on low alluvial flats, and perhaps even in water. They seem to have budded out at the base, forming clumps of plants, while to support themselves they threw out cord-like roots from the lower part of the stem. The fruits were long and generally thin spikes, bearing spore-cases under scales, and were attached to the twigs or branches. Some of the forms reached a length of 30 feet.



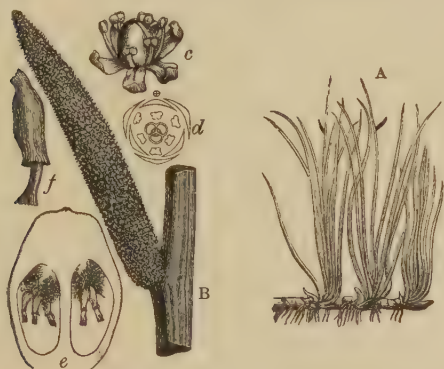
Common Calamary (*Loligo vulgaris*).



Lower part of *Calamites cannaeformis*.

Calamus, the reed pen which the ancients used in writing, was made of the stem of a reed growing in marshy places, probably *Arundo Donax* (see REED), of which the best were obtained from Egypt. The stem was first softened, then dried, and cut and split with a knife (*scalprum librarium*), as quill pens are made. To this day the Orientals generally write with a reed (Arab. *Kālm*).

Calamus, the traditional name of the Sweet Flag (*Acorus Calamus*), which is no doubt the 'Calamus Aromaticus' of Roman authors, and probably the sweet calamus and sweet cane of Scripture, although it has, however, been attempted to identify calamus with one of the fragrant grasses (see LEMON-GRASS) which yield the grass-oil of India. The sweet flag, although resembling Iris in habit, belongs to the order Aroideæ, and is widely distributed through the Eastern palæarctic region, and is also indigenous to North America. It is said to have been introduced into Europe from Asia Minor in the 16th century, and is now widely naturalised in ditches and by the sides of ponds.



A, *Acorus Calamus*, showing rhizome; B, flower-head: c, separate floret; d, floral diagram, showing essentially liliaceous type; e, vertical section of ovary; f, single ovule.

Hooker indeed regards it as a native of Britain. The root-stock yields an aromatic stimulant and tonic, which has fallen into disuse in regular medicine, but is still of high repute in the East. It is in fact cultivated in Ceylon and Burma. It is sometimes used to flavour beer, and in the perfuming of tooth-powder and snuff; and was masticated to clear the voice and sweeten the breath. It is also made into confections and used in the preparation of liqueurs in Germany, &c. The plant was formerly used to strew floors instead of rushes, and particularly in cathedrals on festival days. The name Calamus is also given to a genus of palms. See RATTAN, and DRAGON'S BLOOD.

Calamy, EDMUND, a Puritan divine, was born in London in 1600. He studied at Pembroke Hall, Cambridge (1616-19), where he attached himself to the Calvinistic party; and afterwards became domestic chaplain to Felton, Bishop of Ely. In 1626 he was appointed lecturer at Bury St Edmunds, but resigned his office when the order to read the *Book of Sports* began to be enforced (1636). In 1639 he was chosen minister of St Mary's Aldermanbury, London. He now entered warmly into the controversies of the time, and became noted as a leading man on the side of the Presbyterians. He had a principal share in the composition of *Smectymnus* (q.v.), a work intended as a reply to Bishop Hall's *Divine Right of Episcopacy*, and one of the most able and popular polemics of the day. Like the mass of the Presbyterian clergy, he was monarchical and not republican in his political opinions. He disapproved, therefore, of the execu-

tion of Charles, and of Cromwell's protectorate, and did not hesitate to avow his attachment to the royalist cause. He was one of the deputies appointed to meet Charles II. in Holland, and congratulate him on his restoration. His services were recognised by a royal chaplaincy and the offer of the bishopric of Coventry and Lichfield, which he refused through conscientious scruples (his wife's, according to Tillotson). Ejected for nonconformity in 1662, he continued to attend service in his old church, till heart-broken by the Great Fire of London, he died 29th October 1666. He had published nineteen sermons, &c.—Two of his five sons were educated for a religious profession: the one, Dr BENJAMIN CALAMY (1642-86), rose to be a prebendary of St Paul's, and published *A Discourse about a Scrupulous Conscience*, dedicated to his patron, Judge Jeffreys; the other, EDMUND CALAMY (1635-85), was ejected for nonconformity. His son, EDMUND CALAMY, D.D., born in 1671, studied three years at Utrecht, and, declining Carstares's offer of a Scots professorship, from 1694 was a Nonconformist minister in London. He visited Scotland in 1709, when Edinburgh, Glasgow, and Aberdeen all conferred honorary degrees on him; and he died 3d June 1732. Of his forty-one works, the best known are his *Account of the Ejected Ministers*, and his interesting *Autobiography*, first published in 1829.

Calañas, a town of Andalusia, Spain, about 27 miles N. of Huelva, and 13 miles NE. of Tharsis, with which it was connected by rail in 1887. Here is a large copper-mine. Pop. over 8000.

Calas, JEAN, a French Protestant, remembered as a victim of fanaticism and injustice, was born in Languedoc in 1698. He lived as a tradesman of good character in Toulouse. In 1761, one evening after supper, the eldest son of the Calas family, Marc Antoine, a youth addicted to gambling, and subject to fits of deep melancholy, was found hanged in the warehouse. There was not a shadow of a reason for doubting that the young man committed suicide; but popular rumour accused the father, or other members of the Calas family, of murdering the eldest son, 'because he had contemplated conversion to Catholicism.' It was also asserted that a young man named Lavaysse, who was in the house on the fatal evening, had been despatched 'by the Protestants of Guyenne to perpetrate the murder.' The clergy exerted all their influence to confirm the populace in their delusion. In consequence of the popular excitement the family of Calas was brought to trial for the murder, and several deluded and (perhaps) some bribed witnesses appeared against them. A Catholic servant-maid and the young man Lavaysse were also implicated in the accusation. Calas brought forward many most convincing arguments in his defence, but they were of no avail, and the parliament of Toulouse sentenced the wretched man—by a majority of 8 votes against 5—to torture and death on the wheel! The old man was accordingly put to death on the wheel in 1762. His property was confiscated. His youngest son was banished for life from France, but was captured by the monks, and compelled to abjure Protestantism. The daughters were sent to a convent. The young man Lavaysse was acquitted, and the widow of Calas escaped into Switzerland, where she was so fortunate as to excite the benevolent interest of Voltaire, who brought the whole affair before the public, and, in his book *Sur la Tolérance*, proved that Calas had fallen a victim to religious hatred and popular fanaticism. A revision of the trial followed, and, after full investigation, the parliament at Paris in 1765 declared Calas and all his family innocent.

Louis XV. gave the sum of 30,000 livres to the bereaved family, but neither the parliament of Toulouse nor the fanatical monks were ever brought to account. See Coquerel, *Calas et sa Famille* (2d ed. 1870); Dryander, *Der Prozess Calas* (1887).

Calascibetta, a town in the Sicilian province of Caltanissetta, built on a steep and isolated height opposite Castrogiovanni (q.v.), and 64 m. SE. of Palermo; pop. 9000.

Calatafi mi, a town of Sicily, 20 miles SE. of Trapani, named after its ruined Saracenic castle, Kalat-al-Fimi. Here, in 1860, Garibaldi defeated the Neapolitans. Pop. 11,000.

Calatayud' (Arab., 'Ayud's Castle'), a city of Aragon, Spain, on the Jalon, 130 miles NE. of Madrid. It is built out of the ruins of ancient *Bilbilis*, the birthplace of Martial, which lay about 2 miles to the east. Pop. 11,000.

Calathea, an American genus of Marantaceæ (Scitamineæ), with beautiful leaves springing from a short, root-like stem.

Calatrava la Vieja, a ruined city of Spain, on the Guadiana, 12 miles NE. of Ciudad Real. Its defence against the Moors, undertaken by Raymond, abbot of Fitero, and Diego Velasquez in 1158, after it had been abandoned by the Templars, is famous on account of its having originated the Order of the Knights of Calatrava, which was instituted at Calatrava in 1158, by King Sancho III. of Castile, and was at several periods associated with the Cistercian monks. Their almost uniform success against the Moors gave rise to rashness, and in 1197 they were defeated and nearly exterminated, the survivors transferring the seat to the castle of Salvatierra. In 1523 the grand-mastership was transferred to the crown by a papal bull, the knights being permitted to marry once by way of compensation for their loss of independence. Since 1808 the body has been continued as an order of merit.

Calave'ras, an inland county of California, E. from San Francisco, with a picturesquely varied surface, including hills, cañons, prairies, and forests of oak and pine, besides a grove of mammoth trees that attracts many visitors. The county is rich in granite, quartz, limestone, and slate, and copper and gold are mined.

Calbe. See KALBE.

Calcareous, in Chemistry, is a term applied to substances containing much lime (Lat. *calx*). Thus *Calcareous waters* are those which hold in solution much carbonate and sulphate of lime, and which are generally known as hard waters, and form a deposit in kettles and other vessels when heated therein.—*Calcareous rocks* are those in which lime forms the prevailing element. They may be chemically formed, as in the case of tufas, where a saturated solution of carbonate of lime in water is deposited from evaporation or other causes; but they are generally aqueous rocks, the materials of which are supplied by animal remains. Thus, many rocks, like the mountain-limestone, are composed of shells, corals, and encrinurites; while others, like chalk, consist largely of foraminifera and fragments of other marine organisms. A crystalline structure, varying in degree from the partially crystallised carboniferous limestones to the saccharine statuary marble, is produced in calcareous rocks by metamorphic action. Oolite is a variety of limestone composed of small egg-like grains resembling the roe of fish. The existence of lime in rocks can always be detected by the application of dilute hydrochloric acid, when it effervesces from the liberation of the carbonic acid. Pure lime is obtained from calcareous rocks by calcining them—i.e. by driving off the carbonic acid and other

volatile matter by heat.—*Calcareous soils* are produced from the disintegration of calcareous rocks. When the rocks are perfectly pure, they generally yield barren soils, as in many chalk and limestone districts of Britain; but when the lime is mixed with clay, so as to form marl, and has a little vegetable matter added, it forms an excellent though rather light soil. Calcareous soils are difficult of drainage, owing to the property that soft lime has of retaining water, although it easily yields it up by evaporation. Such soils are consequently soon dry at the surface after rain, but yet rarely suffer severely from drought.

Calcareous Tufa, or CALC-SINTER, consists of carbonate of lime, and is a deposition from springs, streams, or underground water, from which it is precipitated partly by the escape of carbonic acid which acts as a solvent, and partly by evaporation of the water. It is usually white, creamy-white, yellowish, or brownish in colour, but other hues occur, and variegated and mottled varieties are not uncommon. It is of variable texture and consistency; some kinds being rather soft, brittle, and friable, and porous or cellular. These cellular varieties have been deposited from the waters of springs, and often contain vegetable and animal remains, as leaves, twigs, nuts, moss, insects, land and freshwater shells, &c. The so-called 'petrifying springs' of Mortlock afford a good example of the formation of calcareous tufa. In some regions the deposition from calcareous waters is on a very extensive scale, as along the river Anio, at Tivoli, near Rome, where calcareous tufa occurs in masses many feet in thickness. In that district the formation is harder and more compact, and under the name of *travertino* is used as a building stone at Rome. Calcareous tufa is abundantly deposited from thermal springs, as in the Yellowstone Region, North America. The calcareous incrustations so commonly seen in caverns in limestone rocks are varieties of calcareous tufa. They are known as *Stalactites* and *Stalagmites* (q.v.).

Calceolaria (Lat. *calceolus*, 'a little shoe'), a South American genus of Scrophulariaceæ (q.v.), ranging along the western slope of the Andes and southwards to the islands. Several species have reached the Falkland Islands, New Zealand, and Mexico. The species are undershrubs or herbs, mostly perennial, and have terminal panicles or cymes of showy flowers of the familiar two-lipped slipper, or 'fisherman's basket'-like flowers. The colours in this genus vary greatly, and florists have produced innumerable hybrids and varieties since they were introduced about 1830. They are largely cultivated as half-hardy or greenhouse plants, and are easily propagated by cuttings; they grow freely, but require to be well watered. Some of the species are used in South America for dyeing.

Calchas, the famous soothsayer of the Greeks in the Trojan war, was the son of Thestor and Mycene. He foretold the length of the siege, and when the fleet was detained at Aulis by adverse winds, demanded the sacrifice of Iphigenia. He is said to have died at Colophon, from chagrin at being surpassed in soothsaying by one Mopsus.

Calciferous Epoch, one of the subordinate divisions of the Lower Silurian System of North America. The division is characterised by the presence of calcareous sandstones and limestones. In Scotland a subdivision of the Carboniferous System (q.v.) is known as the Calciferous Sandstone group.

Calcination, or CALCINING (see CALX), is the process of heating or roasting in furnaces or in heaps the various metallic ores. It is resorted to as the first stage in the extraction of the majority

of the common metals from their ores, and is essentially a process of oxidation.

Calcite, **CALCAREOUS SPAR**, or **CALC-SPAR**, the name usually given by mineralogists to carbonate of lime, rhombohedral in its crystallisation. It differs from aragonite only in crystallisation (see **ARAGONITE**). Calcite is one of the commonest minerals. Marble, for example, is composed of small crystalline granules of this mineral. It is abundantly met with in very many rocks as a *secondary* mineral; that is to say, it is a decomposition-product—the result of the chemical alteration of various rock-constituents, such as the feldspars. Thus it frequently occurs in the cracks, fissures, and vesicles of igneous rocks (see **AMYGDALOID**). It often completely fills cavities in rocks of various origin; and although it has been prevented by want of space from assuming a crystalline form, is readily divided by the knife and hammer into rhomboids, the primary form of its crystals being a rhomboid, of which the greatest angles are $105^{\circ} 5'$. Its secondary forms are more numerous than those of any other mineral; some seven hundred have been observed. One of the most common, a rather elongated pyramid, is sometimes called *Dog-tooth Spar*. Calcite is colourless and transparent, except in consequence of impurities which may be present in it; and when perfectly transparent, it exhibits in a high degree the property of double refraction of light. The presence of foreign substances frequently renders calcite gray, blue, green, yellow, red, brown, or even black.—*Iceland Spar* is a name given to calcite, at least to the finest colourless and transparent variety, found in Iceland, filling up clefts and cavities in basalt-rocks. *Slate Spar* is a lamellar variety, often with a shining, pearly lustre and a greasy feel, and is found in Wicklow and Glen Tilt, and at Kongsberg in Norway.

Calcium (sym. Ca, atomic weight 40.1) is the metal present in chalk, stucco, and other compounds of lime. It may be obtained by passing a powerful current of electricity through fused chloride of calcium, CaCl_2 , when the metal separates in minute globules. It is a yellowish-white metal, can be rolled into sheets and hammered into leaves, and is intermediate between lead and gold in hardness. It has a specific gravity of 1.55, being more than a half denser than water. At ordinary temperatures, it slowly tarnishes by oxidation; and when placed in contact with water, it rapidly decomposes the water, H_2O , forming lime, CaO , whilst hydrogen escapes. To be retained bright, calcium must be kept under the surface of naphtha. At a red heat, it melts and burns with a dazzling, scintillating white light. Metallic calcium, costing till of late £9 per ounce, dropped in price to 9d. per ounce. Many of the compounds are of the highest importance. When oxidised, either by exposure to air or by combustion, it forms an oxide, *Lime* (q.v.), having the composition of 40 parts of calcium and 16 parts of oxygen. This, when united with water, yields a hydrate, *slaked lime*. For the sulphide, see **LUMINOUS PAINT**. Sulphate of calcium, CaSO_4 , is the chief constituent of *Gypsum* (q.v.). It is present in most drinking-waters, rendering them *permanently hard*, because the sulphate of calcium is not precipitated by boiling the water. Temporary hardness, due to the presence of carbonate of calcium, CaCO_3 , or chalk, is removable by boiling, when the carbonate, which is retained in solution as bicarbonate, is readily decomposed into *Carbonic Acid* (q.v.), which escapes as gas, and chalk, which falls to the bottom.

Calcium carbide, CaC_2 , a compound of calcium and carbon, was discovered by Edmund Davy in 1836, but till about 1892 it was only produced in small quantities and as a laboratory curiosity. Its

property of decomposing water and forming acetylene gas was known, but it was only when, in 1892, chemists in America and Paris simultaneously discovered a method of producing it in quantities that it became commercially of importance, and since that time acetylene gas for illuminating purposes has enormously developed. A mixture of powdered lime and coke-dust is submitted to the action of carbon electrodes at a temperature of about 3300°C . The fused material is removed when cool. Carbide, as it is generally called, is a brown crystalline compound with a specific gravity of 2.22, and is insoluble in most acids and all alkalies; see **ACETYLENE**, **GAS-LIGHTING**.

Calcium phosphate is used in medicine to supply phosphorus for the bones and nerves, the carbonate as an antacid. For calcium sulphate, carbonate, chloride, see **LIME**. For the calcium light, see **LIME-LIGHT**.

Calc-spar. See **CALCITE**.

Calculating Boy. See **BIDDER** (G. B.), **COL-BURN**.

Calculating Machines, as distinguished from simple contrivances such as the Abacus, Schwanpan, Napier's Bones, the Vernier, Sliding Rules, date from that invented by Pascal about 1632. In this machine the addition of each place of figures was performed separately, and subtraction was effected by the addition of the numerical complements. It is not likely that even Pascal himself found this machine of any practical use. In 1666 Sir S. Moreland invented a machine, about 3 by $4\frac{1}{2}$ inches in size, for adding sums of money. In this machine, as in that of Pascal, the addition of each place or order was made separately by hand. Each place had a pair of wheels unconnected with its neighbours, and the carriages were transferred by hand. The multiplication machine of the same inventor was really nothing more than Napier's Bones on circles instead of strips. Some years later, Leibnitz conceived the idea of an enlarged machine which seems to have been designed for important astronomical calculations, the necessity for which had arisen from the discoveries of Galileo, Kepler, and the other astronomers of that century. He spent many years of his life, and more than 24,000 thalers (£3600) on this project, but all that remains is a model still preserved at Göttingen. In 1775 Viscount Mahon, afterwards Earl Stanhope, invented a machine which performs the four rules of arithmetic. It is about 6 by 8 by 18 inches in size. The operator, using both hands, pushes a frame containing twelve prisms of ten sides each, mounted side by side, to and fro in the line of their axes, performing in one direction addition, and in the other subtraction. Each face of the prism has a rack, which engages a toothed wheel, and turns it as many teeth as there are teeth in the rack—0, 1, 2, &c. as required. There is a simple hand adjustment which works like the 'points' of a railway, and shunts the prisms out of the way on each return motion, during which the carriage is done. The set of prisms can be moved laterally for stepping. Multiplication and division are done by successive addition and subtraction. In 1777 a second machine on the same lines was constructed. In 1779 a German named Hahn invented a circular machine; followed in 1784 by another by Müller, likewise circular and worked by a handle at the centre. Subtraction was not done directly, but the arithmetical complement was read off instead of the sum. Stepping was done by shifting the upper plate, multiplication and division by successive addition and subtraction. It was about 12 inches outside diameter.

The next machine invented was one of a very different type. About 1812 Charles Babbage (q.v.), then a student at Cambridge, conceived the idea that logarithmic, trigonometric, and other tables could be calculated by the method of 'differences' by a machine capable of performing only simple addition. An immense range of nautical and astronomical tables lies within these limits, and can be produced by calculating the first few differences, and setting them in the machine. About 1822 he had made a small trial piece, and soon after undertook to superintend, without payment, the construction for the government of a machine to calculate and print such tables. It would have been, when completed, about 6 feet high by 3 broad and 1 deep, and would have had six columns of differences of eighteen or twenty places each. It was never completed, and the design was abandoned in 1842. It is enough here to say that the engagement was to the inventor a disaster, harassing him continually through twenty years; and to government all that remains is a fragment of a beautiful machine which does its work with unerring accuracy, but is useless. It stands in the South Kensington Museum.

About 1850 M. Thomas of Colmar produced a calculating machine of a high degree of excellence, which performs the four rules of arithmetic with surprising speed, and is in extensive use. In this machine, instead of the prism with racks, as in Stanhope's machine, there is a cylinder, on the different sections of which are successively 0, 1, 2, 3, &c. teeth; with each cylinder is a toothed wheel sliding on its axis, and this being brought by a finger-knob opposite the proper section of the cylinder, 0, 1, 2, 3, &c., as required, is added. These cylinders are all moved simultaneously in one direction. The carriage is made afterwards successively. One multiple is produced by each turn of the handle. The stepping is done by raising a long frame or lid on hinges, moving it down one place and letting it fall into the new position. There are contrivances for reversing the motion for subtraction, for destroying the momentum of the moving parts, and for locking them. In 1883 Mr J. Edmonson of Halifax patented a circular machine on the general lines of Thomas's, but modified to suit the circular arrangement. Felt's comptometer (1887, subsequently improved) and Burrough's registering accountant (1888) are American machines extensively in use. The latter is an addition machine of 81 keys, with a capacity of 2000 entries per hour, automatically printing the addenda and the total sum. Behr's addition machine (1892), limited to sums under 500; Illgen's calculator (1888), limited to sums under 1000; and Runge's addition machine (1896), adding numbers of several figures, are German, and also largely used.

Of the analytical engine of Charles Babbage, which does not exist except on paper, there are 400 detailed drawings to scale, with volumes of notes and rough sketches. In 1833, when the fragment of the difference engine was put together, Babbage found that several surprising results which had not been anticipated could be easily produced by causing the table to influence the last difference in various ways; see his *Ninth Bridgewater Treatise* (1838).

Cash Registers are a form of calculating machines which have come into almost universal use in retail establishments as records of cash transactions. The first practical machine of this kind was patented in 1879 by James Ritty of Ohio, U.S. Originally the record was made on adding wheels and shown on a dial by hands. In the National Cash Register Company's 'detail adders,' the mechanism is operated by pressing registering keys.

Each registering key is connected with a corresponding adding wheel inside the register, which shows the total amount of registrations made on that key. For example, if the 'penny' key be pressed five times, its corresponding adding wheel shows a total of fivepence. Many modifications are made.

Another form of calculating machines is the electric tabulating machine devised by Hollerith for recording and summarising the United States census returns. A keyboard of 240 characters operates on punches which perforate holes in cards corresponding to the facts to be recorded for each individual, such as sex, age, or colour. The perforated cards are fed into the machine, which by means of the holes and electric devices records the facts indicated by the holes. Sorting-boxes next secure a combination of the facts recorded, and by means of electric connections the record is made. For some modern machines, see the *Napier Tercentenary Celebration Handbook* (Edin. 1914).

Calculus, or **STONE** (in Medicine), a hard concretion formed within the animal body, in consequence of the deposition in the solid form of matters which usually remain in solution (see **CONCRETION**). The calculi most commonly met with are those formed in the kidneys or bladder (*Urinary Calculus*), and those formed in the gall-bladder or biliary ducts (*Biliary Calculus*).

Urinary Calculus is a disease of all ages, but most common in early and in advanced life and in the male sex. It is also very frequent in gouty persons, or among those who pursue sedentary occupations, and live freely. It is rare among those who live much in the open air, or who take much violent exercise, and use little animal food and wine. Among sailors it is peculiarly rare. In certain parts of the country the disease is said to be frequent, as in Norfolk, and perhaps along the east coast of Scotland. In some parts of India, too, where some of the predisposing circumstances mentioned above can hardly be said to prevail, stone is by no means uncommon. It would appear, therefore, that the predisposing causes of calculus are still very imperfectly understood. In its early stages the disease usually presents itself in the form of *Gravel*, shown by the passage of numerous very small portions of gritty concretions, which may be observed in the urine as a deposit like sand, or like small grains of Cayenne pepper. When such deposits occur frequently, especially if they are present at the time of passing the urine, and not merely after it has cooled, there is reason to apprehend the formation of calculus. If, in these circumstances, there are pains of a dull character in the loins, with occasional twinges of sharper suffering, no time should be lost in seeking medical advice. If a fit of very severe pain should occur in a person for some time affected with gravel, if the urine be bloody, if agonising twinges, commencing in the loins, sting downwards into the thigh or the groin, it is probable that a stone has already formed in the kidney, and is being displaced towards the bladder. Calculus in the bladder is at first attended with little suffering, as compared with that caused by the stone in its passage downwards from the kidney; but unless removed or evacuated, the calculus is sure to enlarge, and it then becomes the cause of one of the most painful diseases that afflict humanity. The existence of a stone in the bladder, however, should never be taken for granted without a surgical examination, as all the symptoms are deceptive in certain cases. The most striking, and perhaps the most trustworthy evidence of stone in the bladder, apart from the use of the sound (see **LITHOTOMY**), is smarting and burning pain experienced after the bladder has been emptied, together with occasional presence of blood in the urine. The correct appreciation of

all the symptoms, however, demands considerable familiarity with such cases.

The discovery of the tendency to urinary calculus at an early period of its growth has been greatly aided by the use of the microscope and of chemical tests. Generally speaking, it may be said that whenever the urine, after standing for a few hours, can be observed habitually to contain more sediment than a very slight cloudiness towards the bottom of the vessel, there is room for careful inquiry into the existence of some derangement of the health. But sediments are not all equally apt to determine calculus, nor is the treatment of the different kinds of sediment at all similar; care should therefore be taken to determine, from time to time, whether the character of the sediment may have undergone a change, so that the treatment may be adapted accordingly.

The chief varieties of urinary calculus are—(1) uric acid (red sand) and urate of ammonia; (2) oxalate of lime; and (3) phosphates of ammonia, magnesia, lime, &c. Calculi formed of other substances do occur, but much less frequently. Calculi are sometimes found to be composed of numerous successive layers, having a perfectly distinct chemical composition. Urates and phosphates in particular frequently succeed each other, and form what is called an alternating calculus.



Alternating Calculus :

a, uric acid nucleus; *b*, oxalate of lime; *c*, phosphates of lime, and of magnesia and ammonia.

When calculus has once fairly formed in the urinary passages, it seems probable that no absolute cure exists except the removal of it, if possible, from the body (see LITHOTOMY and LITHOTRITY); but in the stage of gravel, and still more in the earlier stages detected by careful examination of the urine, much may be done to check the tendency to this distressing and dangerous malady. The chief remedies consist in careful regulation of the diet and mode of living, together with the use of solvents adapted to the particular form of deposit found to be habitually present. See URINE.

Biliary Calculi or *Gall-stones* almost invariably consist of Cholesterin (q.v.) with a variable proportion of biliary pigments, lime, mucus, &c. They are generally formed in the gall-bladder, and while they remain there often give rise to no inconvenience. Their presence is usually first revealed by their passing from the gall-bladder into the cystic duct (see BILE, LIVER), and giving rise to the train of symptoms known as *biliary colic*. Severe pain, either sudden or gradual in its onset, is felt just below the ribs on the right side, and radiating in various directions, but most commonly upwards. It is almost always accompanied by vomiting. When the calculus reaches the common bile-duct it closes it for the time, and if it does not pass

onward into the intestine within a few hours, leads to jaundice. The pain in a severe case is probably the most intense of all known forms of suffering. Happily the attack rarely lasts beyond a few days at most; but, as gall-stones seldom occur singly, is very likely to be repeated at some subsequent period. During such an attack copious draughts of hot water containing bicarbonate of soda in solution often give relief; but large doses of morphia or opium are generally required to control the pain. When the calculus has reached the intestine it is passed onwards and voided with the feces.

Though in the majority of cases gall-stones are thus harmlessly discharged, they may give rise to inflammation, ulceration, or other dangerous complications at any part of their course—in the gall-bladder, the bile-ducts, or the intestines.

The cause of their formation is obscure. They are more common in the female sex, and rare before the age of thirty. Regular habits, plenty of exercise, and simple diet are believed to be the most important means of preventing their formation.

During the last thirty years the gall-bladder has frequently been opened with success for the removal of gall-stones which were causing serious symptoms; and this operation (cholecystotomy) has now a recognised place in surgery.

Calculus, DIFFERENTIAL and INTEGRAL, sometimes called the Infinitesimal Calculus. The scope of the calculus ranges over the whole field of applied mathematics, and an account of its development would involve an account of the chief difficulties that have been overcome in the problems offered by astronomy, mechanics, engineering, and physical science generally. The following is a sketch of the origin, notions, and method of the calculus.

The invention of the calculus culminated with Leibnitz and Newton in the latter half of the 17th century. There need be no surprise at the joint discovery, for after the work of Archimedes, Cavalieri, Roberval, Fermat, Barrow, Wallis, and others, matters were ripe for the generalisation attained by Leibnitz and Newton. The calculus as propounded by these two mathematicians showed considerable diversity of detail. As a basis for the theory, Newton took his methods of *prime and ultimate ratios* and *fluxions* (see FLUXIONS) both fundamentally the same idea, and developed from the ancient notion of *Exhaustions*, while Leibnitz employed his method of *Infinitesimals* (see INFINITE) developed from the *Indivisibles* of Cavalieri as used by Wallis and others. The notations adopted were quite different; and of the two notations that of Leibnitz has proved itself the better, although in Britain Newton's did not give way till well into the 19th century.

After considerable fluctuation of opinion as to the proper foundation for the theory of the calculus, the method of *Limits*, a modification of Newton's methods, is now almost universally adopted. Besides those mentioned, the only other method ever received with favour was Lagrange's method of *Derived Functions*.

In the calculus all quantities except mere constants are regarded as changing from one value to another by continuous growth or according to Leibnitz by infinitesimal differences or *differentials*; and it will help to the understanding of the subject if we divide such quantities into three groups, a classification which is convenient for our present purpose rather than mathematically essential.

(1) The quantity, or quantities, in which the growth originates—i.e. quantities which vary independently of each other and of all other quantities, and which are hence called the *independent variables*.

(2) The quantities whose value depends on the

value of the independent variables, and which are variously named *dependent variables*, or *functions* of the independent variables (see FUNCTION), or, with special reference to the quantities of group 3, *primitive functions*. The quantities of groups 1 and 2 were called *fluents* by Newton. Taking x as the independent variable we have functions of x such as (i.) x^2 , (ii.) $\frac{1}{3}x^3 + C$, (iii.) e^x , (iv.) $\tan x$, (v.) $F(x)$, where F is a sign denoting some function of x not specified. It is often convenient to use a single letter (as y) to denote such functions and then we have the relations $y = x^2$, $y = \frac{1}{3}x^3 + C$, $y = F(x)$, &c., where y is called the dependent variable.

(3) The third group of quantities is what distinguishes the calculus from ordinary algebra, which deals only with the other two, and the discovery by Leibnitz and Newton of the fundamental importance of this group may be said to constitute the discovery of the calculus. These quantities, which are in general, like group 2, functions of the independent variables, are derived in a peculiar way from groups 1 and 2. They express the *rate of change of a function with respect to its independent variable or variables*. Such a rate is called a *derived function* (denoted by $f'(x)$ if the primitive function be for example $y = f(x)$) or a *differential co-efficient* (denoted by $\frac{df(x)}{dx}$ or $\frac{dy}{dx}$). Group 3, as here defined, corresponds very nearly to what Newton called *fluxions*. The derived functions of the first four primitive functions given as examples of group 2, are (i.) $2x$, (ii.) x^2 , (iii.) e^x , and (iv.) $\sec^2 x$.

Also since $f'(x)$ or dy/dx is in general a function of x , its rate of change with respect to x may be considered, and we thus get a second derived function ($f''(x)$), or second differential co-efficient (d^2y/dx^2). Similarly $f''(x)$ may be treated, and so on.

And now we are in a position to indicate the distinction (from the point of view of pure mathematics at least) between the Differential Calculus and the Integral Calculus. The differential calculus seeks to find the derived function when the primitive function is given, while the integral calculus seeks conversely to find the primitive function when the derived function is given.

The treatment of derived functions involves peculiar difficulties, to overcome which various schemes, as already indicated, have been proposed. We shall try to give a clear idea of the meaning of a Limit, and shall then show how this notion meets the case.

Definition.—If there be a fixed magnitude to which a variable magnitude can be made as nearly equal as we please, and if it be impossible that the variable magnitude can ever be exactly equal to this fixed magnitude, the fixed magnitude is called the limit of the variable magnitude.

Fundamental Proposition.—If two variable magnitudes be always equal to one another while each approaches its limit, then their limits are equal to one another. (An indirect proof of this is easy.)

Example: To prove that a circle is equal in area to the triangle whose base is equal to the circumference, and whose height is equal to the radius of the circle. About the circle describe any regular polygon ABCDEF. Make a triangle whose base $A'A''$ is equal to the perimeter of the polygon, and whose height is equal to the radius of the circle. In the line $A'A''$ suppose $A'P'$ equal to the circumference of the circle. Then by increasing the number of sides of the polygon, we can make its area as nearly equal to the area of the circle as we please, but never quite equal to the area of the circle; hence by our definition the area of the circle is the limit of the area of the polygon.

Similarly the triangle $O'A'P'$ is the limit of the triangle $O'A'A''$. Now, the polygon (a varying magnitude) is always equal to the triangle $O'A'A''$

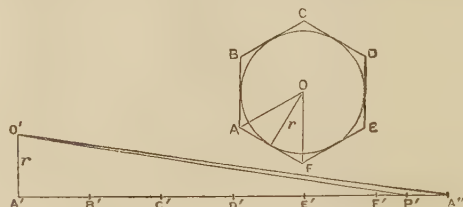


Fig. 1.

(a varying magnitude), therefore, by our fundamental proposition, the limits of these varying magnitudes—i.e. the circle and the triangle $O'A'P'$, must be equal to one another.

In the foregoing geometrical illustration of the use of limits, it will be observed that it is the limits themselves that are all-important, the polygon and the triangle $O'A'A''$ being mere auxiliaries; and so it is always. We shall now take a typical example from the calculus to show the use of limits in the finding of a rate.

Suppose x to be an independent variable, and $y = x^2$ the function under consideration, let us seek to find (1) the average rate of change of x^2 with respect to the independent variable when the independent variable changes from x to $x + \Delta x$, and (2) the limit (if there be one) of this average rate as the interval Δx is diminished.

We take Δx to indicate the change made on x ; let us take Δy to indicate the resulting change in y .

$$\text{We have } y + \Delta y = (x + \Delta x)^2 = x^2 + 2x\Delta x + (\Delta x)^2;$$

$$\text{and } y = x^2 \quad \therefore \Delta y = 2x\Delta x + (\Delta x)^2. \quad (1)$$

Now $\Delta y/\Delta x$ is the measure of the average rate we seek, and from (1) we have

$$\Delta y/\Delta x = 2x + \Delta x, \quad (2)$$

which is the answer to the first part of our question. For the rest, we remark that by diminishing Δx we can make $2x + \Delta x$ as nearly equal to $2x$ as we please, but never quite equal to $2x$; hence $2x$ is, by our definition of a limit, the limit of $\Delta y/\Delta x$.

This limit is denoted by $\frac{dy}{dx}$. It might be denoted by α/β or any other symbol, only the presence and position of y and x in the symbol $\frac{dy}{dx}$ serve con-

veniently to show of what ratio $\frac{dy}{dx}$ is the limit.

dy/dx is called, as has been said, the differential coefficient of y with respect to x , and it may be interesting to get an indication of the origin of this inconveniently lengthy title. In the expansion of $(x + \Delta x)^2$ above, Δx , taken 'infinitely small' by Leibnitz, was called a differential, and $2x$, which turns out to be $= dy/dx$, is the coefficient of the differential; hence the name. The notation of the calculus, being as already stated Leibnitz's, naturally fits best to the infinitesimal theory, but even in quarters where the infinitesimal theory is rejected, the language as well as the notation is often retained for its practical convenience, just as the language of the 'two fluid' theory is kept up in electricity, though the two fluid theory is superseded.

The purely mathematical part of the calculus is concerned largely with the devices for finding the limits of all sorts of functions, as in the above example; and it is only when the calculus is to

be applied to an actual problem, that the use of these limits becomes apparent. We will apply the foregoing result to a problem in mechanics.

Problem.—To find the speed at the end of x seconds of a body which, starting from rest, passes over x^2 feet in x seconds.

Consider the speed at the end of x seconds in relation to the average speed during an immediately succeeding interval. Evidently the speed at the end of x seconds is the limit of the average speed in question, for the average speed can be made as nearly equal as we please to the speed at the beginning of the interval by taking the interval short enough, and the average speed during the interval can never be quite equal to the speed at the beginning. Now the average speed is measured by the length described, divided by the time taken, and is therefore equal to what we denoted by $\Delta y/\Delta x$, hence by our fundamental proposition in limits, the actual speed at the end

of x seconds is equal to $\frac{dy}{dx}$ —i.e. is $2x$ feet per second.

Any trouble that has arisen in accepting limits as the basis of the calculus has been due to the adoption (too frequent unfortunately) of a vicious form of the fundamental proposition, which, for the sake of warning, we shall give here. It is as follows:

Suppose A and B to be equal varying quantities, and LtA , LtB to be their limits.

Since $A = LtA + q$ where q is an 'indefinitely small' or 'infinitely small' quantity, let us say

$A = LtA$ ultimately (and make an indefinitely small error). (1)

Similarly $B = LtB$ ultimately (another indefinitely small error). (2)

Now $A = B$ (by supposition).

Therefore $LtA = LtB$. (By 'compensation of errors' as explained by Berkeley and Carnot.) This argument is not logical, and it is not necessary. Moreover, as equation (1) is usually adopted in the purely mathematical part of the calculus, while equation (2) is adopted in some application probably long after the student has passed equation (1), the compensation of errors is not seen by him, and he feels as if he were always going a little wrong.

The following example is a type of a large class of problems to which the integral calculus is applied.

The curve TPC is traced out by the point P moving so that

$PN(y)$ is a given function of $ON(x)$, or in other words, $y = f(x)$ is the equation to the curve (see GEOMETRY, ANALYTICAL). The problem is to find the area $ABDC$. The area $TONP$ (call it A for brevity) is evidently a

function of ON —i.e. of x . Suppose x to change to $x + \Delta x$ —i.e. suppose ON to become $ON + NN'$. Then A becomes $A + \Delta A$ where

$$\begin{aligned}\Delta A &= PNN'P' \\ &= PNN'M + MP'P \\ &= y \times \Delta x + MP'P \\ &= f(x) \times \Delta x + MP'P.\end{aligned}$$

$\therefore \Delta A/\Delta x = f(x) + MP'P/\Delta x$.
Now the limit of $MP'P/\Delta x$ is the ratio of the

area of the triangle $MP'P$ to Δx . But this is one-half of MP' . Also MP' becomes smaller and smaller without limit as Δx approaches zero. Therefore, in the limit, $dA/dx = f(x)$. Here A is the primitive function of x whose derived function is $f(x)$.

The problem of the integral calculus is to find A when $f(x)$ is known. We have $dA = f(x)dx$. Each dA is an infinitesimal increment of A , and the sum of them all is A . This sum of the infinite number of infinitesimal increments is called the 'integral' of $f(x)$, with respect to x , from $x=0$ to $x=OD$. It is symbolised as

$$\int_0^{OD} f(x)dx.$$

Similarly the area $ABDC$ is

$$\int_{OB}^{OD} f(x)dx = TODC - TOBA.$$

The integral calculus is constantly getting into difficulties through the occurrence in applications of it of functions to be integrated that have never been turned out as results of differentiation, while many of the functions that can be integrated have to undergo tedious transformations to bring them under the form of known derived functions.

The CALCULUS OF VARIATIONS has to take account of changes of form as well as of magnitude in the functions mentioned in group 2 above, while the differential and integral calculus, of which the calculus of variations is an offshoot, deals only with changes in magnitude. Such problems as the following fall under its treatment: (1) To find the curve of quickest descent ('brachistochrone') from one given curve to another given curve. It was a special case of this problem proposed in 1696 that gave rise to the calculus of variation. (2) Given the surface of a solid of revolution, to find its form, that the solid contents may be a maximum. (The result of the first problem is a cycloid, of the second a sphere.) Histories of the calculus of variations have been written by Woodhouse (1810) and Todhunter (1861). For CALCULUS OF FINITE DIFFERENCES and CALCULUS OF FUNCTIONS, see the articles DIFFERENCE and FUNCTIONS.

Calcutta, the capital of the province of Bengal, and till 1911 of British India, is situated on the left bank of the Húgli (Hooghly), an arm of the Ganges, in $22^\circ 34' N.$ lat., and $88^\circ 24' E.$ long., about 80 miles from the sea by the river. Calcutta was founded by Governor Charnock in 1686, by the removal hither from Húgli of the factories of the East India Company. In 1700 three villages surrounding the factories having been conferred upon the company by the Emperor Aurungzebe, in recognition of a present made to his son, Prince Azim, they were forthwith fortified, and received the name of Fort William, in honour of William III. Calcutta is the Anglicised form of Kalikata, as this again is the Moslemised form (1596) of Kali-ghat, a famous shrine of the goddess Kali, which still exists to the south of the city. In 1707 Calcutta had acquired some importance as a town, and was made the seat of a presidency. In 1756, however, a great misfortune befell the rising town; it was unexpectedly attacked by Suráj-ud-Daulá (Surajah Dowlah), the Nawáb of Bengal, and yielding after a two days' siege, was the scene of the tragedy of the 'Black Hole' (q.v.). The city remained in the hands of the enemy until seven months afterwards, when Clive and Admiral Watson recaptured it, and afterwards concluded a peace with the Nawáb. Soon after this, and subsequent to the important victory of Plassey, the possessions of the East India Company were greatly extended by grants made

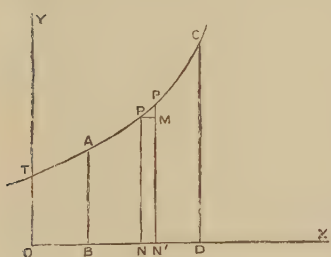


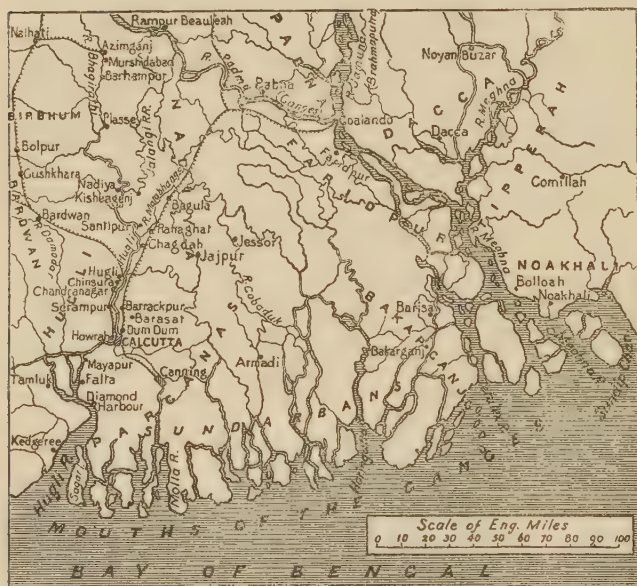
Fig. 2.

by the emperor of Delhi. In 1772 it superseded Murshidabad as seat of the central government in India; in 1852 it was erected into a municipality. In 1837 the population of the town proper amounted to 229,700; in 1881 it had increased to 401,671, or, with port and suburbs, 684,658; in 1911 to 1,222,313; and in 1921 to 1,263,292. Besides these, thousands of the three and a half millions who sleep at night in the surrounding districts of Húgli and the twenty-four Parganas flock during the day to Calcutta, on foot, by boat, or by railway, to their daily toil. Of the inhabitants 67 per cent. are Hindus, 28·2 Mohammedans, and 3·5 Christians. About 12,000 are Europeans; 14,000 Eurasians; and there are a good many Armenians, Greeks, Jews, Parsees, Chinese, and negroes.

The city extends for about five miles along the river, and is somewhat less than two miles in breadth at its broadest part, the area being nearly 8 sq. m. (30 with suburbs), and is comprised for the most part between the river and the Circular Road, a spacious roadway which marks the landward boundary of the city proper. Howrah and other villages on the opposite side of the river contain the government warehouses, large ironworks and timber-yards, a number of the principal jute-

Among other fine buildings is the Government House, a magnificent palace erected (1799-1804) by the Marquis of Wellesley. Beyond this, extending northwards along the river-bank, is the Strand, 2 miles in length, and 40 feet above low-water, with various ghats or landing-places. It is adorned by many fine buildings, including the custom-house, the new mint, and other government offices, and is lined by a splendid series of jetties for ocean steamers. Among other places of interest are the High Court, the Victoria Memorial Hall (opened 1921), the Bengal Government Offices, St Paul's Cathedral, the Scotch kirk (St Andrew's), the Imperial Museum, the town-hall, Bank of Bengal, Jesuits' College, Medical College, the General Hospital, university, the domed post-office, and the Treasury. Calcutta has three theatres, several large European hotels, several fine clubs—the Bengal and United Service, four daily English newspapers, and a number of monuments throughout the city, the most noticeable being those to the Marquis of Wellesley, Sir James Outram, and Sir David Ochterlony, the last a column 165 feet high.

Although the European quarter of the town is distinguished for its fine public buildings and commodious dwelling-houses, the quarters occupied by the natives present a very different appearance, their houses being in most instances built of mud or bamboo and mats, and the streets narrow and unpaved. Great havoc was done here by the cyclone of 1864, which destroyed 40,700 native houses; and those of 1867 and 1870 were likewise very destructive. Considerable improvements have now been effected; new and wider streets have been opened through crowded quarters; brick houses are fast replacing the huts, and an extensive system of drainage has been carried out to the no small advantage of the inhabitants. A new municipal act was passed by the Bengal Council in 1899. The water-supply of Calcutta has been very much improved. Formerly the water was kept in large tanks, interspersed throughout the city, whence it was borne by water-carriers or *bhisties* in large leather bags. But since 1865 a supply of excellent water has been obtained from the Húgli, about 15 miles above Calcutta, where it is filtered and sent down by pipes in the usual way. Subsequent improvements now yield a daily supply



mills, and the great terminus of the East Indian Railway. The appearance of the city as it is approached by the river is very striking; on the left are the Botanical Gardens, destroyed by the cyclones of 1867 and 1870, but since replanted; and the Bishop's College, a handsome Gothic edifice, erected by the Society for the Propagation of the Gospel, and now used as an engineering college; on the right is the suburb of Garden Reach, with the palace in which the ex-king of Oudh resided from the time of the annexation of his territory till his death in 1887; farther on are the government dockyards and the arsenal; beyond these is the Maidan, which has been termed the Hyde Park of India, being the favourite place of resort of the *élite* of Calcutta for their evening drive. Here, near the river, lies Fort William, the largest fortress in India, constructed (1757-73) at a cost of £2,000,000, and occupying, with the outworks, an area of 2 sq. m. It is garrisoned by European and Indian infantry, with a battery of garrison artillery.

of some 36,000,000 gallons of filtered water, with an average consumption per head of 33 gallons a day in Calcutta and the neighbouring municipalities. The result of this and a system of underground drainage, with an outlet into the Salt Lake, has been a marked improvement in the health of the city. A pontoon bridge (1874) connects Calcutta with Howrah (q.v.) on the opposite side of the Húgli, which ranks as a separate city, and is the headquarters of the great jute and other manufacturing industries.

The communications of Calcutta afford great facilities for its extensive commerce. There are several lines of railway to various parts of India: the East Indian to Benares, Delhi, &c.; the Eastern Bengal to Goalundo; and the Bengal-Nagpur to Bombay. In the first years of the 20th century new official buildings were provided for the military administration and foreign affairs, and wide streets and hygienic spaces introduced into the native town; the new docks at Kidderpur

have given nearly 10 miles of quay frontage, and the navigation of the Húglí has been greatly improved. Work on a harbour extension scheme, to cost £3,750,000, was begun in 1920. The river, adjacent to the city, varies in breadth from a quarter of a mile to nearly a mile. Ships of 5000 tons ascend to Calcutta in the usual course, the main difficulty to shipping being the James and Mary shoal, half-way down the river.

The learned societies are mainly of European origin, but several have a considerable native membership. The principal bodies are the Bengal Asiatic Society, founded in 1784 by Sir W. Jones, possessing a fine library; the Dalhousie Institute, for the literary and social improvement of young tradesmen; the Public Health Society; the Microscopical Society; the Photographic Society. The university of Calcutta was founded in 1857 as an examining university. Facilities for research have been provided since 1893, and for teaching since 1909. A new scheme came into operation in 1917. Many colleges in Calcutta and elsewhere are affiliated to the university. Educational institutions are numerous in Calcutta. Among the principal are the Scottish Churches' College, the Martinière College, St Xavier's College, and the four government colleges—namely, the Presidency College, the Sanskrit College, the Madrasa or Mohammedan College, and the Bethune Girls' College. There are also a medical college, a school of art, and an engineering college; while in medical hospitals and charities Calcutta is as well endowed as any European city. The first Protestant missionary settled here in 1758, on the invitation of Clive. Calcutta was the birthplace of W. M. Thackeray.

Calcutta, reproached with being a city of palaces in front and of pig-sties behind, may be regarded as the great commercial centre of Asia. The seaborne trade of the province of Bengal, including treasure, has a value of about £100,000,000 a year; and about 97 per cent. of this trade belongs to Calcutta. Of the total value of Indian produce exported in an average year, Calcutta was found to have contributed 15 per cent. in jute, 14 per cent. in grains and pulses, 13 per cent. in tea, 11 per cent. in oil-seeds, 7 per cent. in indigo, 7 per cent. in hides and skins, 4 per cent. in raw cotton, and 2 per cent. in raw and manufactured silk; while other exports, of which lac, saltpetre, and castor-oil are the most important, made up the balance. Calcutta exports enormous numbers of gunny-bags (in some years over 600 millions, worth over £11,000,000). Tea and wheat are among the most important exports. The port is annually entered by about 800 steamers, with an aggregate tonnage of some 1,500,000 tons. For other particulars as to the trade and manufactures, education, &c. of the capital, see the article **BENGAL**. See also **INDIA**, **HOUGHLY**, **BLACK HOLE**, **CLIVE**, **HASTINGS**, **EAST INDIA COMPANY**, and the articles on Bishops Heber and Cotton and on Dr Duff. As a great central depot for the richest parts of India, including the Ganges valley and Assam, Calcutta has an extensive inland trade. In an ordinary year the imports by rail, steamer, and country boat may amount to over £75,000,000, and the exports to £60,000,000. As a place of residence Calcutta is perhaps the pleasantest city in India, though by no means the most economical.

See C. R. Wilson, *Old Fort William in Bengal* (1906); Miss Blechenden, *Calcutta Past and Present* (1906); with the works of Yule, Wheeler, and Forrest.

Caldara da Caravaggio, **POLIDORO**, Italian painter, born at Caravaggio about 1492, was murdered by his servant at Messina in 1543. He aided Raphael in his Vatican frescoes. His 'Christ bearing the Cross' is in Naples.

Caldecott, **RANDOLPH**, artist, was born at

Chester on the 22d of March 1846, and was a clerk in a bank, first at Whitechurch (1861-67) and then at Manchester (1867-72). Having developed a great talent for art at an early age, he was encouraged by his success in the London illustrated papers to remove to the metropolis. His health, however, soon gave way, and, after vain attempts to restore it by trips abroad, he died at St Augustine, in Florida, on the 12th of February 1886. Randolph Caldecott was without an equal as the exponent of the humours of animal life and the joys of the country-house and hunting-field. He contributed frequently to *Punch* and the *Graphic*, and occasionally exhibited at the Royal Academy, the Dudley, and the Grosvenor Galleries. In 1882 he became a member of the Institute of Painters in Water-colours. Randolph Caldecott will chiefly be remembered by the admirable *Caldecott's Picture-books*, which began in 1878 with *John Gilpin* and *The House that Jack Built*. He also illustrated Washington Irving's *Old Christmas* (1875) and *Bracebridge Hall* (1877); Mrs Comyns Carr's *North Italian Folk* (1878); Blackburn's *Breton Folk* (1880); and Mrs Ewing's *Daddy Darwin's Dovecote* and *Jackanapes* (1884). See his *Personal Memoir* by R. Blackburn (1886).

Calder, **WEST**, a small town of Midlothian, 16 miles WSW. of Edinburgh; pop. 2600.—**MID-CALDER**, 4½ miles nearer Edinburgh, has some 600 inhabitants; and **EAST CALDER**, close by, is a small village. The district has shale and coal mines and oil-works.

Caldera, a port of Chile, 38 miles WNW. of Copiapó, in a desert region, exports ores.

Calderon, **PHILIP HERMOGENES**, **R.A.**, painter, born at Poitiers of Spanish parentage in 1833, studied in London and Paris, and regularly contributed to the Royal Academy from 1853, his subjects being chiefly historical or imaginative. He was elected an Associate in 1864, and an Academician in 1867. He exhibited at the Paris Exhibitions of 1867 and 1878, receiving at the former the first medal awarded to English art, at the latter a first-class medal and the Legion of Honour. In 1887 he was appointed keeper of the Royal Academy. He died April 30, 1898.

Calderon de la Barca, **PEDRO**, Spain's greatest dramatist, was born of a good old family at Madrid, 17th January 1600, and, after four years' schooling under the Jesuits, from 1613 to 1619 studied law and philosophy at Salamanca. Already in 1614 he had written his first play, and at the poetical contests of 1620 and 1622 had won Lope de Vega's praises, when in 1625 he chose the profession of arms, and, during ten years' service in the Milanese and in Flanders, saw much of men and manners that he afterwards utilised. Nor meanwhile did he neglect the muse, but wrote many dramas which were acted with great applause; so that, on Lope's death in 1635, he was summoned by Philip IV. to Madrid, appointed a sort of master of the revels, and made, two years later, a knight of the order of Santiago. In 1640 the rebellion in Catalonia roused him once more to take the field; but in 1651 he entered, like Lope, the priesthood, and in 1653 withdrew to the 'chantry of the new kings' at Toledo. Ten years went by, and he was recalled to court, to the resumption of his dramatic labours, receiving, with other preferments, the post of chaplain of honour to Philip, whose death, in 1665, deprived him of a generous Mæcenas. Yet still he continued to write for the court, the church, and the public theatres, till, on 25th May 1681, in the words of his friend, De Solis, 'he died, as they say the swan dies, singing.' His remains, already

translated from their first resting-place in 1841, in 1869 were finally laid in Spain's new pantheon, the former convent of St Francis in Madrid. A bronze statue of him was unveiled in 1880; and his bicentenary was celebrated with great splendour in the May of the following year.

Castilian and Catholic to the backbone, Calderon wrote for his contemporaries, his fellow-countrymen, his co-religionists, not for posterity or the outer world. Hence, though his plays still hold their own in Spain, to that outer world he must ever be caviare. It cannot rightly appreciate his perfect fidelity to the Spanish thought and manners of his age; his passion seems to it bombast, his nice points of honour fantastic, and his plots, with their matchless *coups de théâtre*, a very labyrinth for intricacy. This, though Schlegel pronounced him 'the fourth in a mighty quaternion, with Homer, Dante, and Shakespeare.' This, too, in spite of the many fine English versions of his masterpieces; and in spite of the verdict of a great English critic, that, 'though inferior to Shakespeare in knowledge of humanity and in power of developing his characters from within, to Æschylus in solemn passion, to Sophocles in the structure of his plays and in statuesque power of grouping, to Goethe in metaphysical subtlety—yet in pure poetry Calderon is the equal of them all, and second to none of them as a master of stage effect.' His *autos sacramentales*, outdoor plays for the festival of Corpus Christi, number 72, and have been divided into seven classes—biblical, classical, ethical, and so forth; the finest of them is *El Divino Orfeo*. Of his regular dramas 118 are extant. There are the religious plays (such as the Faust-like *Magico Prodigioso* and *El Purgatorio de San Patricio*); the historical (*El Principe Constante*—Prince Ferdinand of Portugal); and the philosophic (*La Vida es Sueño*). There are the 'cloak and sword' plays (*La Dama Duende*, 'The Fairy Lady'), and the dramas of passion (*El Medico de su Honra*, *El Pintor de su Deshonra*, and *El Mayor Mostruo los Zelos*, 'No monster like jealousy'). There are many others; but classification becomes tedious and difficult; and it is these eight plays, with a dozen more, that are best known to English readers through the renderings of one or more of the following translators: Shelley (a fine fragment from *The Magician*); Denis M'Carthy (10 plays, 1853–73); FitzGerald (8 plays, 1853 *et seq.*); Trench (2 plays, with essay, 1856; 2d ed. 1880).

In 1888 Mr Norman Maccoll edited the Spanish text of four of the important plays, with notes and introduction. The best edition of the *autos* is that of Apontes (6 vols. Madrid, 1759–60), and there is a good German translation of them by Lorinser (18 vols. 2d ed. 1882); the best editions of the plays are by Hartzenbusch (4 vols. Madrid, 1848–50), and Garcia Ramon (Madrid, 1882). See the German works of Schack (1846), Fr. Schmidt (1857), Fastenrath (1881–82), and Günthuer (1888); Ticknor's *Spanish Literature* (1849); Lasso de la Vega's *Estudio de las Obras de Calderon* (1881); and Miss Hasell's *Calderon* ('Foreign Classics Series,' 1879).

Calderwood, DAVID, an eminent Scottish divine and ecclesiastical historian, was born in 1575, it is thought at Dalkeith, and after studying at the university of Edinburgh, was in 1604 ordained minister of Crailing, Roxburghshire. Opposed to the designs of James VI. for the establishment of Episcopacy, in 1617 he joined in a protest against a bill, then before the Scots parliament, for granting the power of framing new laws for the church to an ecclesiastical council appointed by the king, and in consequence he was summoned before the High Commission at St Andrews, committed to prison for contumacy, and then banished the kingdom. He retired to Holland, and in 1623 published there, under the anagrammatic

pseudonym of 'Edwardus Didoclavius,' his celebrated controversial work, *Altare Damascenum*, in which he rigorously examined the origin and authority of Episcopacy. After King James's death in 1625, he returned to Scotland, and for some years was engaged collecting all the memorials relating to the ecclesiastical affairs of Scotland, from the beginning of the Reformation there to the death of James VI. In 1640 he became minister of Pencaitland, Haddingtonshire; and in 1643 was appointed one of the committee for drawing up the *Directory for Public Worship in Scotland*. He died at Jedburgh in 1650. From the original MS. of his *History of the Kirk of Scotland*, preserved in the British Museum, an edition was printed for the Wodrow Society (8 vols. Edin. 1842–45).

Caledonia, the name applied by the Romans to the country north of the Wall of Antoninus, which ran between the Firths of Forth and Clyde. First occurring in Lucan (1st century A.D.), it was probably, like *Britannia*, a Latin coinage from a native name—*Calido*. The 'Caledonian Forest' (Lat. *Caledonius Saltus* or *Silva Caledonia*; Welsh *Coed Celyddon*; the *Kalēdonios Drumos* of Ptolemy) was a thick wood of birch and hazel extending from the west of the district of Menteith to Dunkeld (Gaelic *Duncalden* or *Dunchallann*, 'town or stronghold of the Caledonians'). By Scott and others the name *Caledonia* has been poetically applied to the whole of Scotland. See Rhys's *Celtic Britain*, and article SCOTLAND.

Caledonian Canal, a chain of natural lakes united by artificial canals, running straight across the north of Scotland in a south-westerly line from the North Sea to the Atlantic, through Glenmore, or the Great Glen of Albin, in Inverness-shire, and touching Argyllshire at its southern extremity. The sea and fresh-water lochs in this line are the Moray Firth and Lochs Dochfour, Ness, Oich, Lochy, and Linnhe. The canal was formed to avoid the dangerous and tedious navigation of ships, especially coasting-vessels, round by the Pentland Firth, Cape Wrath, and the Hebrides; the distance between Kinnaird's Head and the Sound of Mull by this route being 500 miles, but by the canal only 250, with an average saving of 9½ days for sailing-vessels. From the head of the Moray Firth to that of Loch Linnhe, the length of the canal is 60½ miles, 37½ miles being through natural lochs or lakes, and 23 miles by artificial cuts. Each cut is 120 feet broad at surface, and 50 at bottom, and 17 deep. The highest part is Loch Oich, 105 feet above sea-level; and there are in all 28 locks. The practicability of this great work was first shown by James Watt's government survey in 1773; but it was not till 1803 that it was begun under Telford. The whole line was opened for ships in 1823; and after three years of repair, it was reopened in 1847, the total cost up to 1849 being £1,311,270. Ships of 500 to 600 tons can pass through the canal. The annual expenditure as a rule exceeds the income. It is used by fishing-boats and tourist-steamers. The scenery is romantic on both sides, and there are many objects of interest, such as Fort William, Ben Nevis, Inverlochy Castle, Tor Castle (the ancient seat of Cameron of Lochiel), Glen Spean, Glen Roy with its Parallel Roads, Fort Augustus with its monastery, the Falls of Foyers, and Inverness.

Calendar (from *Calends*), the mode of adjusting the natural divisions of time with respect to each other for the purposes of civil life. For the measurement of time, as for the measurement of any other magnitude, some standard must be adopted. The earliest standard interval was the day, marked out by the alternation of light and darkness, and determined by the rotation of the

earth on its axis. For longer periods, the lunar month, from new moon to new moon, an interval of about 29½ days, was the standard next fixed upon; and finally the recurrence of the seasons suggested the year. The duration of the year was determined in various ways by the nations of antiquity, one of the earliest ways being to make it include a certain number of lunar months. Twelve lunar months, giving a year of 354 days, were taken as a near approach to a course of the seasons. In process of time, however, it was discovered that with this rough approximation to the true value of a year the seasons did not correspond to the same months, and it was necessary, in order to prevent them gradually making the round of the whole year, to make some adjustment. For this purpose the Jews and the Greeks employed much the same expedients; they intercalated a month from time to time, the former 7 times in a cycle of 19 years, the latter 3 times in a cycle of 8. The Romans are said, and the statement is confirmed by what is known of their sacred rites and customs, to have had originally a year of 10 months, beginning with March and ending with December, which means 'tenth' period. Early in their history, however, they adopted, from their belief in the luck attendant on odd numbers, a lunar year of 355 days, and added two new months, January and February. But, like the Greeks, they were compelled, in order to accommodate their lunar year to the solar year, to make occasional intercalations. The making of these intercalations was in the hands of the pontiffs, who had sole charge of the calendar, and they used this power unscrupulously for the gratification of their friends or the annoyance of their enemies. They lengthened or curtailed the year, often in order that a magistrate or farmer of the taxes might enjoy a longer or shorter lease of office than was permitted by law, and without regard to the unsettlement of the seasons, and at the time when Julius Cæsar became dictator, the spring festivals occurred in the nominally summer months. To clear away all this confusion, Cæsar, with the help of Sosigenes, an Alexandrian astronomer, undertook a thorough reform of the calendar. He effected it by making the year now called 46 B.C., 'the year of confusion,' consist of 445 days, and the succeeding years of 365 days, with the exception of every fourth year, which was to consist of 366. This method of adjusting the days to the year is called the Julian calendar. The number of days in the months from January to December before Cæsar's time had been respectively 29, 28, 31, 29, 31, 29, 31, 29, 31, 29, 29. These numbers Cæsar changed to 31 and 30 alternately, with the exception of February, which was to have 29 in ordinary years and 30 in leap-years. In honour of himself he also changed to July the name of the month which followed June. In the application of the Julian correction to the calendar the pontiffs again went wrong, by inserting the leap-years once in every three instead of every four years. This mistake of theirs continued till the year now called 8 B.C., when three leap-years too many had been reckoned, and Augustus ordained that there should be no leap-year for 12 years, which, according to the Roman way of counting, would make leap-year occur in 4 A.D. At the same time Augustus gave his own name to the month following July, added one day to it which he took away from February, and that there might not be three consecutive months of 31 days each, he made September, October, November, December consist of 30, 31, 30, 31 days, instead of 31, 30, 31, 30.

The Julian calendar assumes the length of the solar year to be 365½ days, whereas it is 11 minutes and a few seconds less. This annual

error, a small one doubtless, accumulated as years rolled on, and began to be fully recognised about the beginning of the 16th century. Some proposals, such as that of Stöffler in 1518 and of Pitatus of Verona in 1537, were made to rectify the error, but the matter was not taken up in earnest till 1577, by Pope Gregory XIII. As in 1582 the vernal equinox occurred at a date (11th March) 10 days earlier than it did at the time of the Council of Nice in 325 A.D., Gregory published a bull, dated 1st March 1582, annulling 10 days, so that what would have been reckoned the 5th October 1582 was to be reckoned the 15th October. In order also that the displacement might not recur, it was further ordained that three of the leap-years which occur in 400 years should be considered common years. The three leap-years selected to be reduced to common years were those which close the centuries (i.e. which end with 00) and are not divisible by 400. Thus, 1600 was leap-year; 1700, 1800, and 1900 were common years; 2000 will be leap-year; 2100, 2200, 2300 common years; 2400 leap-year; and so on. This method of adjusting the days to the year is called the Gregorian calendar, or the new style. The new style was adopted exactly according to the mandate of the pope in Spain, Portugal, and part of Italy; in France and some of the provinces of the Low Countries it was adopted in the same year by calling the 10th of December the 20th, and the 15th of December the 25th; and by Continental Roman Catholics generally before the end of the 16th century. Most Protestants, however, were then too much inflamed against Roman Catholicism in all its relations to receive even a purely scientific improvement from such hands, and it was more than a century before they abandoned the old style. In England a bill to this effect was brought before parliament in 1585, but did not get beyond a second reading in the House of Lords; and it was not till 1751 that an act was passed (24 Geo. II.) 'for regulating the commencement of the year, and for correcting the calendar now in use.' It was then enacted that 11 days should be omitted after the 2d of September 1752, so that the ensuing day should be the 14th. The enactment was not carried out without provoking discontent among uneducated people, many of whom imagined that they were defrauded of the omitted days, and assailed unpopular statesmen with the cry, 'Give us back our 11 days.' The reason for the omission of the additional day is that according to the old style 1600 and 1700 were both considered leap-years; according to the new style 1700 was a common year. At present, since 1800 and 1900 were leap-years by the old style, and common years by the new style, there is a difference of 13 days between the styles. The Greek Church adheres to the old style; but the orthodox states adopted the Gregorian calendar in 1916-23. The same English act which introduced the new reckoning in 1752 shortened by nearly three months the year 1751. For it had been the practice to commence the year with the 25th of March, the Feast of the Annunciation, and the year 1751 so commenced, but the year 1752 and all subsequent years began with the 1st of January. Scotland had adopted that date for New Year's Day in 1600. In the national accounts of the United Kingdom, the financial year closely corresponds still with the old practice.

In 1793 the National Convention of the first French republic decreed that the common era should be abolished in all civil affairs, and that a new era should commence from the foundation of the republic, 22d September 1792. The year was to be divided into 12 months of 30 days each, with 5 complementary days at the end, which were

to be celebrated as festivals, and were dedicated to Virtue, Genius, Labour, Opinion, Rewards. Every fourth or 'Olympic' year was to have a sixth complementary day to be called 'revolution day,' and every period of four years was to be called a Franciade. The first, second, and third centennial years—viz. 100, 200, 300 were to be common years, the fourth centennial year 400 was to be a leap-year, and this was to continue till the fortieth centennial year 4000, which was to be a common year. The months were to be divided into three parts of 10 days each, called decades. The names of the months and the days of the Gregorian calendar to which they corresponded were as follows:

Vendémiaire (Vintage).....	Sept. 22 to Oct. 21.
Brumaire (Foggy).....	Oct. 22 " Nov. 20.
Frimaire (Sleety).....	Nov. 21 " Dec. 20.
Nivose (Snowy).....	Dec. 21 " Jan. 19.
Pluviose (Rainy).....	Jan. 20 " Feb. 18.
Ventose (Windy).....	Feb. 19 " Mar. 20.
Germinal (Budding).....	Mar. 21 " Apr. 19.
Floral (Flowery).....	Apr. 20 " May 19.
Prairial (Pasture).....	May 20 " June 18.
Messidor (Harvest).....	June 19 " July 18.
Thermidor (Heat).....	July 19 " Aug. 17.
Fructidor (Fruit).....	Aug. 18 " Sept. 16.

By Napoleon's command this new system was abolished, and the use of the Gregorian calendar resumed on January 1, 1806.

In the Jewish calendar, whose reckoning counts the years downwards from the Creation, the year is luni-solar and may be ordinary or embolismic. An ordinary year has 12 months (354 days), an embolismic year 13 months (384 days). The names of the months are Tisri, Hesvan, Kislev, Tebet, Sebat, Adar (with Veadar in embolismic years), Nisan, Yiar, Sivan, Tamuz, Ab, Elul; the New Year (1st Tisri), which falls between 5th September and 5th October, fell in the Jewish year 5681 at sunset 12th September 1920.—Other information as to time-reckoning will be found at CHRONOLOGY. For the Ecclesiastical calendar, see EASTER, GOLDEN NUMBER, INDICTION, SAINTS; for the Positivist calendar, see POSITIVISM; for the Mohammedan, HEGIRA; see also DAY, MONTH, PERIOD, YEAR; Jas. C. Macdonald's *Chronologies and Calendars* (1897), and Hon. E. M. Plunkett's *Ancient Calendars and Constellations* (1903).

Calender. See DERVISH.

Calendering is the process of finishing the surface of linen, cotton, and other textile fabrics, as well as paper, by combined moisture, heat, and pressure. It is usually done by passing the fabric between cylinders pressed together with great force. The familiar domestic processes of starching and ironing afford the simplest illustrations of the object and result of calendering. The patent domestic mangle effects the same object as the flat iron, and is indeed a calender without the element of heat.

In Beetling (q.v.), the cloth is beaten in a way which produces a supple, leathery finish; but in calendering, the pressure is applied continuously across the whole width of the fabric, which stiffens it and gives it a smooth and solid finish.

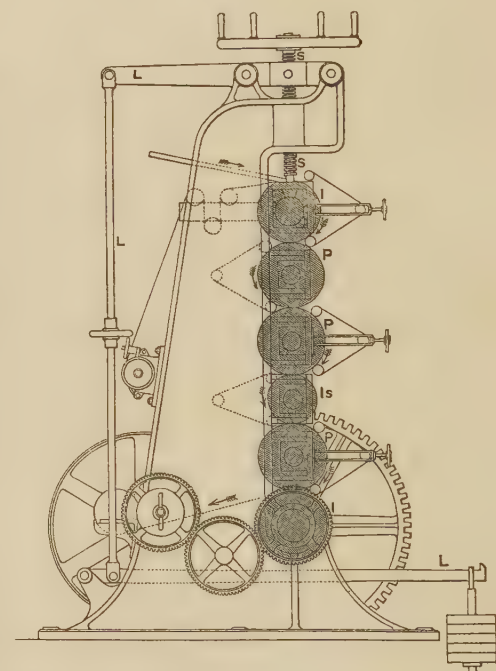
Calenders are made with from 3 to 12 cylinders, usually called bowls, but the number of these does not commonly exceed six. There are always one or more of the bowls made of paper or cotton pressed into a solid mass by hydraulic apparatus. These have a hard yet considerably elastic surface, and are not liable to warp like wood. They require to be turned very accurately. The other bowls, where wood is not employed, are of steel, chilled cast-iron, or brass. One or more of the metal cylinders are made so that they can be heated with steam, gas, or electric heating.

Printed calicoes, after being starched, are usually smoothed by passing them between bowls or

cylinders of hardwood and one of brass under considerable pressure. This is called mangling. What is called the Swiss finish for cotton fabrics is done by a similar process in which greater pressure is employed, but it is termed calendering. In the simplest machine three bowls are used, two of paper or cotton, and one of polished iron. A still higher gloss or glaze is put upon cloth by a friction calender in which the metal roller is driven at a slightly greater speed than the paper ones. Either hot or cold calendering may be employed for these fabrics, which are usually damped previously.

Jute and strong linen cloth are subjected to heavy calendering, the pressure being applied to the cylinders either by levers or hydraulic power. One kind of hydraulic calender for these goods works under a total pressure of eighty-five tons.

Calenders are now used at most paper-mills for putting a smooth finish, or it may be a high glaze, upon paper. The annexed figure shows one with six bowls. The three bowls, P, P, P, are made of



compressed paper or cotton, and the other three, I, I, Is, are of chilled cast-iron. The bowl, Is, is heated with steam, and the care required in using this cylinder is shown by the fact that it must be turned on the inside as well as on the outside to insure a uniform temperature on the surface. This calender is 11 feet high, is driven by a steam-engine of 20 horse-power, and the maximum pressure applied does not exceed 10 tons. As the figure shows, the pressure is regulated by screws, S, and compound levers, L, one of each being attached to each of the two end frames. The arrows show the direction the paper takes over the cylinders.

Some calenders used for the swissing, or ordinary calendering, of calico have the same number of bowls as shown in the figure, but in them the paper and the metal ones are arranged alternately. Such calenders have the same arrangement of screws and compound levers. Machines similar in construction to the one above described, but with all the rollers of iron, and also called calenders, are used for rolling india-rubber into sheets for coats, shoes, &c.

Calends (Lat. *Kalendæ*), the first day of each Roman month, which was divided into *Calends*, *Nones*, and *Ides*. The Calends always fell upon the first of the month; in March, May, July, and October, the Nones on the 7th, and the Ides on the 15th; and in the remaining months, the Nones on the 5th, and the Ides on the 13th. The Calends meant originally the day on which the order of days was proclaimed; the Nones were so called from being the *ninth* day before the Ides, reckoning inclusively; and the Ides probably from an Etruscan verb signifying to divide, because they nearly halved the month. This threefold division also determined the reckoning of the days, which were not distinguished as with us by the ordinal numbers *first, second, third, &c.*, but as follows: Those between the Calends and the Nones were termed *the days before the Nones*; those between the Nones and the Ides, *the days before the Ides*; and the remainder, *the days before the Calends* of the next month. Thus, the Ides of January happening on the 13th of that month, the next day would not be termed by a Latin writer the 14th, but the 19th *before the Calends of February*, reckoning inclusively—i.e. reckoning both 14th of January and 1st of February, and so on to the last, which was *pridie Calendas*. Augustus's favourite phrase, *Ad Kalendas Græcas*, became a proverbial equivalent for 'never.' The Greek calendar had no Calends.

Calen'dula. See MARIGOLD.

Calenture, an old term of Spanish origin for a temporary delirium or fever occurring on board ship in hot climates, probably due to exposure to the sun's rays, was revived in the Spanish American war and applied to Cuban fever.

Calepino, or DA CALEPIO, AMBROGIO (1435-1511), lexicographer, was born at Bergamo. He became an Augustinian monk, and spent his whole life in compiling a long famous polyglot dictionary (Reggio, 1502). The name Calepinus or Calepine came practically to mean a dictionary.

Calgary, a city of Alberta, on the Canadian Pacific Railway, 2262 miles W. of Montreal. It stands 3380 feet above sea-level, in a broad and level valley between the Bow and Elbow rivers, and is the trading centre for a wide stock-raising and agricultural district, with vast stores and varied manufactures. As a divisional centre on the Canadian Pacific Railway and seat of its western carshops it provides work for thousands of men. There was an oil-strike and boom in 1914. The city only dates from 1884, but by 1921 had a population of over 63,000. See ALBERTA.—There is a bay of this name on the north-west coast of the island of Mull in Scotland.

Calhoun, JOHN CALDWELL, Vice-president of the United States, was born in Abbeville district, South Carolina, on the 18th March 1782, of Scotch-Irish Presbyterian descent. Graduating at Yale, he became a successful lawyer, and member of congress for his native state, was prominent as a supporter of the measures which led to the war of 1812-15 with Great Britain. In 1816 he supported a bill for establishing a protective tariff, and reported to congress a measure for the creation of a national bank. In 1817 he joined Monroe's cabinet as Secretary of War, and in 1819, at the request of congress, submitted a plan for an extensive system of internal improvements. His labours in the reorganisation of the war department were of extreme value to the country. He was vice-president of the United States under the presidency of John Q. Adams (1825-29), and under that of General Jackson from 1829 to 1832, when he resigned the office. He prepared the first draft of

the *South Carolina Exposition* of 1829, a document of 56 printed pages, which distinctly marks the commencement of a new stage in Mr Calhoun's career. In this paper he announced the doctrine that a state can nullify unconstitutional laws, the principal reason set forth for the proposed exercise of this alleged right being the differing interests of different sections of the country, free trade being regarded as highly advantageous to the more southern states, and a protective tariff being conceded to be no less desirable for other parts of the country. The breach in his personal friendship for President Jackson (1830) completely freed him from old party affiliations, and left him free for a new political career. His *Address to the People of South Carolina* (1831) set forth with great force his newly developed theory of state rights. The passage by South Carolina in 1832 of the nullification ordinance was the occasion of his resignation of the vice-presidency, and of his entering the United States senate. Mr Calhoun accepted the compromise tariff of 1833. The remainder of his political career was that of a leader of the states-rights movement, and a champion of the real or supposed interests of the slave-holding states. More clearly than almost any other man in the country he understood the radical differences then existing between the social and industrial systems of the northern and southern states, and foresaw the bloody consequences which might sooner or later result from those differences. He left the senate in 1843, and in the following year became Secretary of State under President Tyler, in which capacity he signed a treaty by which it was proposed that Texas should be annexed to the Union. In 1845 he resumed his place in the senate. He strenuously opposed the war of 1846-47 with Mexico. He died at Washington of pulmonary disease, combined with a cardiac affection, March 31, 1850. Mr Calhoun, though not a man of great learning, possessed high intellectual power, fine logical ability, enormous capacity for labour, keen political foresight, and strong will; and his personal integrity and moral purity were never called in question. The *Life of Calhoun*, by R. S. Jenkins (1851), contains most of the accessible details of his personal career. See also his collected works (6 vols. 1853-54), with a Life by R. K. Crallé, and H. von Holst's *John C. Calhoun* (1882). The latter book discusses the leading events of Calhoun's career as viewed from an anti-slavery standpoint. With Henry Clay and Daniel Webster he formed 'the great triumvirate' of American political leaders, which was not a triumvirate in the sense of a close political union, for the three great orators were never closely associated, and were often in antagonism. Mr Calhoun seriously regarded slavery as a blessing to all concerned with it; and the systematic defence of that institution was the main purpose of almost all his public acts during the later half of his life. Calhoun was tall and slender, with a deeply lined face. See also his *Correspondence*, edited by J. F. Jameson (1900).

Cali' (SANTIAGO DE), a town of Colombia, on a tributary of the Rio Cauca, 3300 feet above the sea, 50 miles SE. of Buenaventura; pop. 45,500.

Caliban (apparently a bye-form of *Cannibal* or *Carib*) seems to have found his way into Shakespeare's *Tempest* directly or indirectly from Pigafetta's account, in his *Voyage of Magellan* (see MAGELLAN) of the cannibal Patagonians, huge monsters who raged like bulls, calling on Setebos.

Calibre, or CALIBER, is a technical name for the diameter of the bore of a firearm, whether a piece of ordnance or a small-arm. If the weapon is rifled its calibre is measured, not from the bottom of the grooves, but from the smooth surface between

them, technically called the 'lands.' Ordnance firing solid shot were formerly denoted by the weight of each shot, as 24-pounder, 68-pounder, &c.; mortars and shell-guns by their calibre, as 13-inch mortar, 10-inch shell-gun, &c.; but now that all guns fire shell, this rule is not always observed. It has become usual to designate guns heavier than the 80-pounder, together with all howitzers and mortars, by their calibre, and lighter natures by the weight of the shell; but in every case the weight of the gun itself is also specified, as the 17.8-inch gun of 100 tons, the 80-pounder of 5 tons. Machine Guns (q.v.) and rifles are always classified by their calibres.

Calico-printing. At present this name is almost restricted to the art of imprinting coloured patterns on cotton cloth or calico. The production of coloured patterns on cloth is of great antiquity, and the art appears to have flourished for many centuries in China, India, Egypt, and Persia. One very old method, which is still used in Java under the name 'Battik' printing, consisted in applying the desired design to the cloth in wax and then dyeing the cloth. The parts covered with wax were protected from the action of the dye, and on removing the wax after dyeing, a white pattern was obtained on a coloured ground. In Europe, calico-printing first started in the countries bordering on the Mediterranean, and spread later to Holland and Germany; Augsburg, in the latter country, being celebrated for its printing in the 17th century. The first printworks in Great Britain appear to have been established at Richmond, Surrey, by a Frenchman about the year 1676. At the present date the chief seats of the industry are in Great Britain, France, Germany, Russia, Italy, Switzerland, Belgium, Holland, Japan, India, and the United States. Until the middle of the 18th century the designs were applied to the cloth by means of wooden blocks which were cut out by hand and used in the same manner as rubber stamps are to-day. A separate block had to be made for each colour in the design, and these were applied to the fabric in succession, so that the process was naturally a slow one. It is, however, still used for special purposes. The speed was increased by the 'perrotine,' which furnished the blocks with colour and applied them to the fabric automatically, but could only be used for three colours. The greatest improvement was the invention of the cylinder printing-machine by a Scotsman named Bell in 1875. This completely revolutionised the trade owing to the great increase in speed, and to the ease with which several colours could be printed at once. In recent years the main progress has been in the introduction of new colours and new methods of applying them.

In the cylinder printing-machine the designs are engraved on copper cylinders, which are supported in the printing-machine by an iron spindle or 'mandril.' A separate cylinder has to be used for each colour. There are numerous methods of engraving the patterns on the cylinders. In one method it is simply cut out by hand. In the 'pantograph' method, the carefully turned and polished cylinder is coated with varnish and placed in a special machine called a pantograph. In this machine the worker runs a pointer over the outline of an enlarged copy of the design, and by an arrangement of levers the motion of this pointer is transmitted to a number of diamond points, which scratch copies of the design, of the correct size, through the layer of coating-varnish. When this operation is completed the cylinder is placed in a bath of dilute nitric acid, which etches the copper at the places exposed by the scratches. The varnish is then cleaned off, and the engraving finished by hand. Very good results

are obtained by the 'mill and die' method. The pattern is cut on the die, which is a small cylinder of soft steel about an inch in diameter. This is then hardened and used to impress a reverse pattern on another cylinder called the 'mill,' which is then hardened and used to impress the design on the actual printing-cylinder by revolving the two cylinders in contact under high pressure. The use of copper rollers is a cause of great expense in printworks, and entails large capital.

Printing-machines.—The principle of a calico-printing machine will be understood by the annexed diagram (fig. 1),

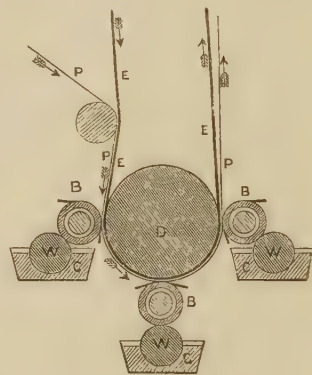


Fig. 1.

prints a portion of the pattern. These are placed against the drum, over which the calico moves to receive the impression from them. W, W, W are wood rollers covered with cloth, and dip into colour-boxes, C, C, C, as they revolve, each imparting its colour to its own cylinder. Two long blades called the 'lint doctor' and the 'colour doctor' act upon these cylinders, the one removing loose fibre, the other superfluous colour. Fig. 2 gives a view of a complete machine for printing ten colours, the arrangements in it being much the same as for a smaller number. It shows that the iron mandrils which support the printing-cylinders rest in bearings on side frames, and that these cylinders revolve by toothed wheels working in the teeth of a large spur wheel. The small wheels are fixed on the iron mandrils, and there is a system of screws, levers, and weights for pressing the copper cylinders against the central drum. These cylinders require to be adjusted with mathematical precision in order to print accurately. When roller-printing was introduced, more than a hundred years ago, only one colour was printed at a time, the machines having but one printing-cylinder. Machines are now made to print as many as sixteen colours at one operation.

Duplex Printing.—If the cloth is to be printed on both sides a duplex machine is often employed. This consists of a machine fitted with two large printing-drums or 'bowls,' each with its own set of printing-rollers, &c. The bowls are usually mounted one above the other, and after being printed on one side in the lower part of the machine, the cloth passes up round the upper bowl, following an S-shaped course, and is printed on the other side on the upper bowl.

Thickenings.—In order to prevent the colour solutions from 'running' on the cloth, and to obtain sharp outlines, they must be suitably thickened. The thickenings chiefly in use are either starches of various kinds or starch products or else gums. The starches chiefly used are wheat, maize, and tapioca, and also their respective flours. The starch products include British gum, dextrine, &c. The gums include gum-arabic, gum-senegal, and gum-tragacanth, besides numerous others. The

starches are mixed to a paste with cold water, and then boiled in large jacketed copper pans fitted with stirring-gear. The gums are usually soaked in water and then boiled. In many cases the colours, &c., can be boiled up with the thickening, but in others the thickening must only be added when quite cold. The colours must be carefully strained before use to remove any lumps which might cause uneven printing, and also any gritty substances which might injure the printing-rollers. The colour pastes are usually strained by squeezing them by hand through fine cotton cloths. In the printing directions given below it is to be understood that the necessary thickening is added. It has been left out to save space.

The Printing Process.—Before printing, the cotton must be well bleached, especially for the

to the fastness of the colours, in order to clean the whites and to remove the thickenings. In some cases the pieces are given a treatment with a dilute bleaching solution in order to clear the whites better. After a final wash with water and drying, the pieces are ready for finishing for the market by starching, calendering, &c.

Dyestuffs.—The colouring matters employed in printing are, with few exceptions, the same as those used in cotton-dyeing, although their relative importance for these two purposes varies considerably. For practical purposes they may be divided into the following classes: (1) direct cotton dyes; (2) basic or tannin dyes; (3) acid dyes; (4) mordant dyes; (5) sulphur dyes; (6) vat dyes; (7) insoluble azo dyes; (8) aniline black and other oxidation dyes; (9) mineral dyes; (10) pigment colours. For a description of the above classes of dyes, see the article on Dyeing.

Mordants.—Many of the above dyes require the use of a mordant (see DYEING) in order to fix them in a satisfactory manner on cotton. The chief mordants employed in printing are Tannic Acid (q.v.) for the basic colours, and various compounds of aluminium, chromium, iron, and tin for the mordant colours proper. Besides the above, various fatty substances are employed in the fixing of some of the colours. The metallic mordants used in printing are usually acetates, and when cotton printed with them is steamed, acetic acid is split off and escapes as a gas with the steam, whilst the metal usually remains fixed on the cloth in the form of an insoluble basic salt, which can then combine with and fix the mordant dyestuff in the form of an insoluble colour lake. Acetates of alum and iron are known as red and black liquors respectively, being chiefly used in the production of red and black colours.

Printing Styles.—Most of the dyestuffs can be applied in printing by a number of different methods which are known as 'styles.' Suppose, for example, that a single coloured pattern is to be printed with a mordant dyestuff on a white ground. One method would be to print a suitable mixture, containing both the dye and the mordant, direct on to the cotton. A second method would be to mordant the whole surface of the cloth, and then to print on some substance which would remove or destroy the mordant at the printed places, and finally to dye the cloth with the necessary mordant dyestuff. Where the mordant had been 'discharged' the dye would not be fixed, so that a white pattern would be left on a coloured ground. A third method would be to print the mordant in the desired pattern, and then to dye the whole piece; whilst a fourth would be to mordant and dye the whole piece first, and then to print a 'discharge' which would destroy the dyed colour. Finally, some substance might be printed which would 'resist' the subsequent application of the mordant or dye. The first method is called the direct printing style, or, in cases where steaming is necessary, the steam style. The second would be the discharge style; whilst the third is known as the madder style, having been formerly much used with that dyestuff. The fourth is a simple discharge print; whilst the last would be a 'resist' style. The methods for applying the various classes of dyes according to the above styles will next be considered, but, for convenience, the

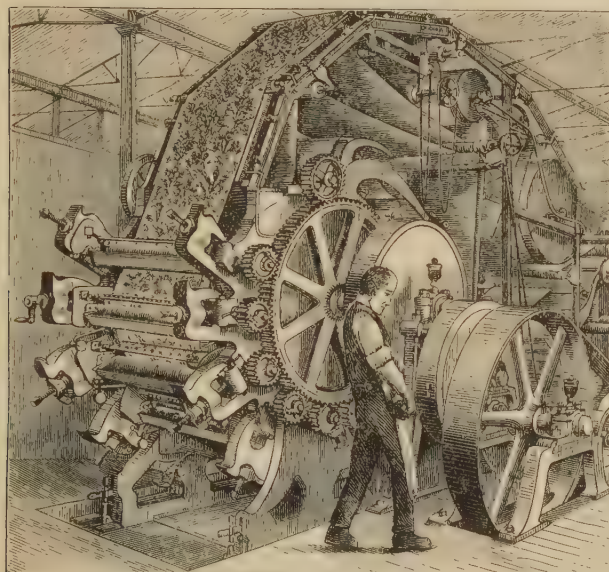


Fig. 2.

madder style, as any traces of impurity left in the cotton are liable to attract dyes or mordants from the various baths, and so cause dirty 'whites' (see BLEACHING). The cotton must also be singed, as any loose fluff would spoil the sharpness of the outlines. For some colours (see below) the cloth must be prepared with oil before printing. After printing, the cloth is usually dried either by hot air or else by passing it over heated copper cylinders, and then, in most cases, must undergo a steaming process in order to develop the proper colours and fix them on the cotton. The duration of the steaming varies from a few minutes to an hour or more, and the steam pressure used also varies with the particular colour from nothing up to 30 pounds or more to the square inch. For short steaming, the cloth is often passed over guiding-rollers through a small chamber called an 'ager.' This is heated with steam-pipes and steam is blown in. The cloth passes in through a narrow slit, travels up and down over the rollers, and finally emerges through the same or another slit. For longer steaming very large chambers on the same principle are used, or else the cloth is simply hung in closed cylinders called 'cottage steamers,' in which it is steamed under the desired pressure.

After steaming, some colours require a treatment with various chemicals in order to complete the fixation of the colour, and the pieces are then well washed with hot water or soap solutions, according

printing of the vat, insoluble azo, and oxidation dyes will be treated in separate paragraphs.

DIRECT PRINTING.—Direct cotton dyes are seldom used for direct printing, but, if required, are printed with a weak alkali—e.g. sodium phosphate, steamed lightly and finished without washing. *Tannin Dyes.*—Print with a colour containing the dye (dissolved usually in acetic acid), and also tannic acid; dry, steam, and pass through a solution of some antimony salt—e.g. tartar emetic—in order to fix the colour. *Mordant Dyes.*—The print colour contains the dyestuff and the necessary mordants; it is printed, dried, and steamed. In some cases the cloth must be first prepared with an oil mordant. *Acid Dyes.*—These are not much used, but are sometimes printed like mordant dyes. *Sulphur Dyes.*—These are printed with sodium hydrosulphite and caustic soda, and then steamed and oxidised. *Pigment Dyes.*—These are mainly of a mineral nature—e.g. vermilion, Prussian blue, &c. They are printed with albumen, and then steamed in order to coagulate the albumen and so fix them on the cotton mechanically. *Printing of Mordants.*—The cloth is printed with a suitably thickened solution of the required mordant, dried, aged, and dunged (see Madder Style, below).

DISCHARGE PRINTING.—This style is of great commercial importance and gives very good results. The cotton is usually first dyed the required ground-colour by one of the ordinary dyeing methods, and then a discharge is printed which destroys the dyed colour in the printed places. In some cases the cloth is first mordanted, and then the mordant is discharged in the required pattern, after which the piece is dyed as in the madder style (see below). As a general rule steaming is necessary after printing in order to complete the discharging action.

The various discharges employed may be divided into four main classes: (1) Oxidising discharges, which contain such substances as chlorates, prussiates, &c., and effect the discharging action by oxidation. (2) Reducing discharges, containing hydrosulphites, tin crystals, zinc-dust &c., and acting through their reducing properties. (3) Alkaline discharges, containing caustic soda, &c., and acting mainly through their solvent action on the dyes and mordants. (4) Acid discharges—e.g. citric acid; these are chiefly used for discharging metallic mordants by their solvent action. Coloured discharges are obtained by adding to the discharge pastes, dyes, or pigments which are not affected by the discharging process.

Direct cotton dyes are usually discharged with hydrosulphite; tannin dyes, by chlorates or other oxidising discharges; mordant dyes, sometimes by chlorates. Turkey-red, which is by far the most important member of this class, is discharged by the two following methods: (1) The dyed material is printed with citric acid or some other organic acid, dried, and passed through a solution of bleaching-powder. The acid decomposes the bleaching solution in contact with the printed places, and discharges the colour there by oxidation. (2) The dyed cloth is printed with a strongly alkaline colour, steamed, and washed. The colour is dissolved at the printed places. Sulphur dyes are discharged with chlorates. *Mordant Discharging:* (a) *Metallic Mordants.*—The cloth is padded with the mordant, dried, and an acid discharge printed; the material is then aged and dunged previous to dyeing. (b) *Tannin Mordants.*—The cloth is mordanted with tannin, dried, and printed with caustic soda, which removes the tannin in the printed portions.

RESIST PRINTING.—In resist printing the white material is printed with a colour which, when applied to the fibre, will prevent dyes or mordants from adhering to the resisted portions if the material be subsequently over printed or dyed. The resisting

effect may be due to chemical or mechanical action, or both, according to the particular process employed. *Tannin Dyes.*—Print a resist containing antimony or zinc salts, and overprint with a tannin steam colour. Where the resist is printed the tannin colour is only superficially fixed, and is removed by washing. *Mordant Dyes.*—These may be resisted by printing an acid colour (citric acid), and overprinting with a steam mordant colour. *Sulphur Dyes* may be resisted with zinc chloride.

As with discharge printing, coloured effects can be produced by the addition of suitable colours to the resist pastes. Inert substances—e.g. china-clay—are frequently added to the resist pastes in order to assist their action mechanically by forming an impervious layer on the cloth.

MADDER STYLE.—In this style the colour is applied by a dyeing operation, the mordant having been previously fixed on the fabric by printing. The mordant pattern may be prepared either by mordanting the whole piece and then printing a discharge, or else by printing the mordant direct. In either case, if the mordant used be a metallic acetate, an 'aging' process is necessary in order to fix it on the fibre. The mordant is aged by passing the pieces through moist chambers kept at a moderately hot temperature, in order to drive off the acetic acid and so fix the mordant. To remove any unfixed mordant which might bleed off and stain the 'whites,' the pieces are 'dunged' by passing them through a mixture of hot water and cow-dung, which appears to combine with any loose mordant and prevent it from settling on the 'whites.' Other substances—e.g. phosphate, arsenate, or silicate of soda—are sometimes used in place of cow-dung. The piece is then washed and dyed. Madder has been replaced by the artificially prepared alizarin. The following example will illustrate the process:

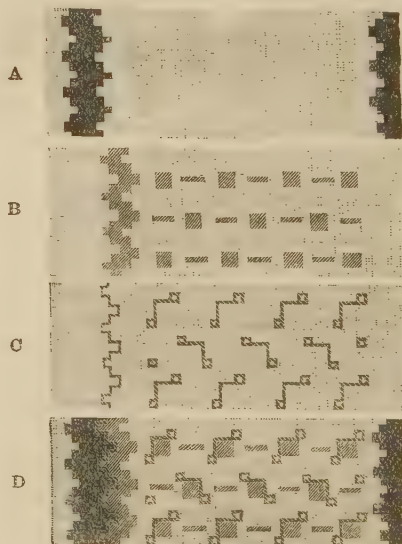


Fig. 3.

Suppose that a pattern in three colours is required, it can be produced in this way by using only madder or alizarin as the dye. Three mordants are employed in printing on the pattern. One of these is 'red liquor,' another is 'black or iron liquor,' and the third is a mixture of these two. A separate roller and colour-box (really, in this case, a mordant-box) is used for each of these in the printing-machine. When the cloth is printed, aged, dunged, and dyed, the result is that, with the same solution of alizarin, the alumina (red liquor) mor-

dant has produced a red, the iron mordant a purple, and the mixed mordant a chocolate colour. The accompanying woodcuts represent a pattern thus produced. Fig. 3, A, shows the chocolate portion from the first roller, B the purple portion from the second roller, C the red portion from the third roller, and D the complete pattern made up of all three colours. The impression from each roller is shown separately in these, but the full pattern is printed at one operation in the machine. If a design is required with each of these colours in two shades, then each mordant is prepared of two strengths, and six rollers are necessary to print the pattern, one dye-bath being used as before.

The dyeing consists in passing the mordanted calico through a solution of alizarin in a dye-beck or cistern heated by steam, over which is supported a winch, which serves to draw the cloth in a continuous manner through the dye until it is saturated with the colour. The operation of 'clearing' follows the dyeing, and this is effected by boiling the cloth in soap-and-water. Clearing removes any dye from the unmordanted portions of the calico, leaving the pattern sharp and distinct.

VAT DYES.—By far the most important member of this class is Indigo (q.v.); the others, which are mainly of recent introduction, are usually applied by similar methods to those used for indigo. Being insoluble in water, they require a special process to apply them to the fabric (see DYEING).

Direct Printing.—One of the chief methods depends on the fact that glucose, in presence of caustic soda, can reduce indigo to its soluble derivative, indigo-white. The cloth is padded with a solution of glucose, dried, and printed with a colour containing indigo and caustic soda. On steaming, the indigo is reduced to indigo-white, which dissolves in the soda and is absorbed by the cotton. The steamed pieces are then well washed with water in contact with air in order to oxidise the indigo-white back again to the insoluble indigo-blue, which remains fixed on the cotton. A newer method consists in printing a colour containing indigo, caustic soda, and hydrosulphite, followed by steaming, &c. This obviates the use of glucose.

Discharge Printing.—There are two main methods. (1) Print a chlorate colour on the dyed fabric, and then steam. (2) Print a chromate on the dyed cloth, and pass the latter through a bath containing sulphuric and oxalic acids in order to liberate chromic acid in the printed places and so destroy the dye by oxidation.

Resist Printing.—Print the dyed cloth with a paste or 'pulp' containing metallic salts, china-clay, fats, &c., so as to form an impervious layer on the printed portions, and then dye in the vat. On removing the resist by washing after dyeing, a white pattern is produced on a blue ground. If lead salts be added to the resist paste and the cloth be passed through a chrome solution after dyeing, a yellow pattern is produced by the formation of chrome-yellow at the printed places.

INSOLUBLE AZO DYES.—These require a special process (see DYEING). The following details relate to para red, the most important member of the class.

Direct Printing.—Pad the cloth in a caustic soda solution of beta naphthol, dry and print with a thickened diazo solution prepared from paranitraniline, and wash well. The red pattern is formed directly the diazo touches the prepared cloth.

Discharge Printing.—This is done with hydrosulphite in the usual manner.

Resist Printing.—Pad the cloth with naphthol solution, dry and print a resist containing tin crystals, dry and pass through the diazo solution of paranitraniline.

ANILINE BLACK (see DYEING).

Direct Printing.—Print a colour containing

aniline salt, sodium chlorate, and yellow prussiate, and steam. The colour is produced by the oxidation of the aniline during the steaming. A subsequent chrome-bath is advantageous. Aniline black cannot be discharged.

Resist Printing.—Pad the cotton in a solution containing aniline salt, chlorate of soda, and yellow prussiate; dry carefully, and print a resist of an alkaline or reducing character—e.g. acetate of soda or hydrosulphite. On steaming, the black is developed except in the resisted portions, which remain white.

Consult Knecht, Rawson, and Loewenthal, *A Manual of Dyeing* (1910); Matthews, *Laboratory Manual of Dyeing and Textile Chemistry* (1909); Cain and Thorpe, *The Synthetic Dyestuffs* (1905); Green, *The Organic Colouring Matters* (1908); Rothwell, *The Printing of Textile Fabrics* (1897); Duerr, *Bleaching and Calico Printing* (1896); *The Dyer and Calico Printer*; *Journal of Society of Dyers and Colourists*; *Die Farber-Zeitung*; *Revue Générale des Matières colorantes* (Lefèvre); Dreaper, *The Chemistry and Physics of Dyeing* (1906); Lauber, *Handbuch des Zeugdrucks*.

Calico-wood, or SNOWDROP-TREE, a genus of American shrubs of the family Styracaceæ, with showy white drooping flowers.

Calicut, a seaport of Malabar, Madras Presidency, 6 miles N. of Bepur terminus, and 566 SSE. of Bombay. It was the first spot in India visited by Covilham (1486) and Vasco da Gama (1498), being then the chief emporium on the coast, with stately dwellings and magnificent pagodas. So populous and powerful was it that it twice repulsed the Portuguese, slaying their commander in 1509, and expelling Albuquerque himself, after a momentary success on his part, in 1510. In 1792, when it fell into the hands of the English, the city was little better than a ruin. Since then it has made considerable progress in trade and population, and is still a growing place. It is the headquarters of the Malabar district, and has a custom-house, salt depot, barracks; the anchorage is an open roadstead. The French have a factory here, founded in 1698. The Arabic spelling of the name is *Qalicut*, mediæval Latin *Callicuthia*. The cotton cloth at first exported hence was called 'calico' or 'kalyko' by the English, apparently through the French *calicot*. Pop. 82,000.

Calidarium. See BATHS.

Calidris. See SANDERLING.

Calif. See KHALIF.

California, the most important Pacific coast state of the American Union, bordering on Oregon, Nevada, Arizona, and the Mexican territory of Lower (or Old) California, is popularly known as the Golden State or, in the west, simply as 'the Coast'; the parallels of 32° 28' and 42° N. lat. mark its S. and N. limits. The name California was given by the Spanish discoverers to the peninsular or Mexican territory, being transferred by them from Montalvo's *Las Sergas de Esplandián* (a continuation of his *Amadis*, q.v., 1508), in which it occurs as the name of an island full of gold and precious stones. The state has an area of 158,297 sq. m., including 2645 sq. m. of water. It is thus larger than any other state or territory except Texas and Alaska. It is larger than Italy or Norway, and more than a fourth larger than Great Britain and Ireland.

The aspect of the country is extremely various, yet everywhere very different from that of the Atlantic and central states of the Union. Along the eastern border of the state, throughout the greater part of its length, extend the ranges of the Sierra Nevada (of which there is, however, in general, one main range), having a breadth of from 75 to 100 miles from east to west. In

the extreme north the Sierra Nevada narrows and falls off in height; but by a relatively low ridge it connects with the Cascade Range (q.v.), which is both geographically and geologically its northward extension. The scenery in this part of the state is generally attractive, and often (as in the wonderful Yosemite and Hetch-Hetchy valleys) it is very striking. There are ten peaks which exceed 10,000 feet in height; Mount Whitney (14,898 feet) being higher than any other in the United States outside of Alaska. Several peaks have perpetual snow on their crests, and some small glaciers exist in the range. West of the Sierra Nevada lies the central valley of California, drained by the Sacramento River from the north, and the San Joaquin from the south, the two rivers having a common delta, and discharging their waters into the bay of San Francisco, through a shallow expanse called Suisun Bay. The eastern slope of the great valley is very gradual, while the opposite side of the Sierras has a sharp and precipitous descent towards the great basin of Nevada. The Coast Mountains do not form any very clearly defined range, but consist of a number of ill-defined ridges. In the north they are blended with the mountains of the eastern system; but to the north of the state limits the two systems again separate. To the south of the San Joaquin Valley a transverse ridge connects the coast-ranges with the Sierra, or its southern extension, separating to some extent Southern California from the rest of the state. This southern region occupies nearly one-fourth of the area of the state. Geologically, the coast-ranges are in general of much more recent date than the Sierra proper. The coast-line is mostly high and rocky, with only a few bays and harbours.

Extending more than 700 miles from north to south, and having great variations in respect of height, California presents a great variety of climatic conditions. In the north-west the rainfall is excessive, and in the north the winters are rather severe than mild; the coast region of the northern half of the state is damp, with cool or cold nights, even in summer. But Southern California, in temperature and productions, has a semi-tropical character; and the serenity of its climate has made it famous as a winter-resort and as a place of residence for invalids. In the south the scanty rainfall and the extreme summer heat detract from an otherwise perfect climate. In general it may be said that the winters in California are mild, and the summers dry, and not intensely hot, though often very dusty. There are practically but two seasons—a more or less rainy winter, and a nearly rainless summer. Extremes of temperature are much less marked than in the states east of the Rocky Mountains. The mean temperature in winter at Humboldt Bay is 43°5', in summer 57°5'; at Fort Yuma the winter mean is 57°, while the summer mean is 90°. In the interior the thermometer sometimes reaches 120° in summer.

Besides the San Joaquin and Sacramento and their tributaries, the principal rivers are the Rio Colorado, which forms the boundary between this state and Arizona; the Klamath River and its tributary the Trinity; the Mad, Smith, Eel, and other rivers, mostly small and flowing to the Pacific. Some of the interior streams flow to lakes and 'sinks' with no outlet to the sea. The principal lakes are Tulare Lake, which at high-water pours its surplus into the San Joaquin River; Clear Lake, noted for its beauty; Lakes Klamath and Rhett (or Tule) on the Oregon boundary; the great lakes of Modoc county, which have no outlets; the high mountain lake Tahoe, noted for its fine scenery; and the strongly alkaline and saline Mono and Owens lakes, which occupy ancient craters. Some of the dried-up lakes of the south-east have left basins lower than the sea-level.

The geology of the state presents some difficult problems, though its general features are simple. It would appear that a large part of the rock-formation was deposited by extinct rivers flowing seaward during the Palæozoic era, throughout a great part of which time the ocean seems to have washed the western shores of the Rocky Mountain chain. The Sierra Nevada is to a great extent an upheaval dating from about the end of the Jurassic period. To the northward there are abundant evidences of much more recent volcanic action, such as the great lava beds of the north-east; and earthquakes, usually slight, are still frequent. The Sierra Nevadas in their turn suffered great denudation, and the wash from their sides forming an off-shore deposit, was at length slowly upheaved into the coast mountains. They may be assumed to date from near the end of the Miocene period. The richest finds of gold have been in detached Jurassic and Triassic fields along the slope of the Sierras, or at their base. The gold production of the state, at one time enormous, greatly declined. In 1848-64 the annual production was \$56,000,000; in 1892 it was only \$12,000,000. It has since revived; in the five years to 1901 it averaged over \$15,000,000 annually, and in 1920 it was \$14,311,043. The ores at present worked are chiefly the abundant low-grade and lean ores, such as, if worked by the processes which prevailed a few years ago, would not afford a fair profit. Three-fourths of the annual product in bullion is now obtained from quartz; the rest mainly by hydraulic and drift mining. Quick-silver, lead, and silver ore are also largely obtained. Among the valuable minerals obtainable are borax, rock-salt, marbles, asphalt, potash-salts, native soda, sulphur, kaolin, and many others. California in 1920 produced 103,377,361 barrels of petroleum, valued at \$178,394,937. Natural gas, suitable for fuel, is reported to be found at various points. The coals of California are low-grade lignites, and are not extensively wrought. Copper, iron, chromium, antimony, and other metals abound.

But the metallic and mineral wealth of the state is not more remarkable than the range and magnitude of its agricultural resources. Wheat and barley are the most important and abundant cereals. Oats do well, and maize grows in certain districts. The ordinary root-crops and garden vegetables flourish well, except potatoes, which, however, do well locally. Alfalfa, or lucerne, is a leading forage-crop. Experiments have shown that cotton, sugarcane, and rice can be grown in the interior valley, and beet-sugar also. Nearly all the valuable fruits of the temperate zone flourish admirably, as well as the orange, lemon, fig, olive, almond, and pomegranate. Vast amounts of dried and otherwise preserved fruits are exported. The culture of semi-tropical fruits has latterly had a great extension in the central valley. The European grape-vine thrives finely here, and in general culture it replaces the native American species. The raisins of California are of high excellence and are abundantly produced; brandy and wine are of course no longer made. The breeding of sheep and cattle is extensively carried on, wool especially being a staple product. Silk-growing is conducted on a moderate scale. Bee-keeping is a pursuit of great importance, some of the honey-farms ranking among the largest in the world. Dairy-farming is locally important. In the arid sections of the south extensive systems of irrigation have been put in operation. Irrigation is carried on by the network of flumes or ditches left by the placer system of mining for gold, as also by pumping and by artesian wells sunk through the dry and porous alluvial soil to the gravel beneath.

The native flora of California is very distinct from that of the country east of the Rocky Moun-

tains. Mention should be made of the 'big trees' (*Sequoia gigantea*; in Britain commonly known as *Wellingtonia*), noteworthy for their enormous size; also of the valuable redwood (*Sequoia sempervirens*), which forms extensive forests in the north. The country has a large number of interesting native shrubs and flowering plants. Several species of Eucalyptus and of other Australian trees have been introduced, and thrive remarkably. In the extreme south palm-trees and other subtropical plants locally occur. The forests, especially to the north, afford great amounts of timber, and the manufacture and shipment of lumber constitute an important industrial feature. Other leading branches of manufacture are petroleum-refining, the drying and preserving of fruits, the packing of meats, wood and metal industries. Many other manufacturing interests are in course of development. California blankets have a wide reputation for excellence. The fisheries are large and of growing importance. A considerable proportion of the product of the Alaska fisheries is marketed by way of San Francisco, and the ocean traffic of the state is chiefly centred at that port. The principal exports are wheat, barley, wool, honey, hops, timber, provisions, metals, ores, borax, and other minerals; fish and furs, largely from Alaska; dried, preserved, and green fruits, including oranges, prunes, raisins, and almonds. In 1900 California ranked among the five great wheat-growing states; but it now ranks low. There are 10,000 miles of steam railways in the state, besides 3500 miles of electric urban and inter-urban lines.

The university of California is at Berkeley. The Lick Observatory, with its famous Telescope (q.v.), belongs to the state university, but is at Mount Hamilton, 50 miles south of San Francisco. The Leland Stanford University is at Palo Alto (q.v.). Pop. (1850) 92,597; (1860) 379,994; (1870) 560,247; (1880) 864,694; (1900) 1,485,053; (1910) 2,377,549; (1920) 3,426,861, including about 160,000 coloured persons, Indians, Chinese, and Japanese. The immigration of Chinese (in the proportion of twelve males to one female) attained an enormous maximum in 1882, but was almost wholly stopped by restrictive legislation in that year. Landholding by Japanese was restricted in 1913.

The principal cities and towns are San Francisco (q.v.); Los Angeles, the metropolis of Southern California, and largest city on the Pacific slope of North America; San Diego, in the extreme south, which has the only commodious harbour in the state, excepting that of San Francisco; Oakland, Alameda, and Berkeley, which may be considered suburbs of San Francisco; Bakersfield and Fresno, in the south part of the central valley; Sacramento, the capital of the state; San Bernardino, in the south; Stockton, near the centre; San Buenaventura, Santa Cruz, and Santa Barbara, on the coast; San Jose and Monterey, each formerly the state capital; Pasadena, Long Beach, Vallejo, Riverside, Richmond, Santa Ana, Santa Monica.

History.—The peninsular (and still Mexican) territory of Old California was visited by Spaniards as early as 1534; and Cortez himself is believed to have surveyed the Gulf of California in 1536. Sir Francis Drake visited the coast in 1578. The early missions of what is now the state of California were under Franciscan control, and for many years thrived wonderfully. With the rest of Mexico, California became independent of Spain in 1822. This region was chiefly important for its export of hides and skins until after the war of 1847 between the United States and Mexico, one of the results of which was the transfer of Upper California (vastly more extensive than the present state) to the flag of the United States. The discovery of gold in 1848 was followed by an enormous excitement and

an inrush of gold-seekers. California was admitted to the Union in 1850. The administrative organisation was too weak to keep in order the wild lawless spirits who abounded amongst the new comers. Crimes of violence were frequent and were apt to go unpunished. Lynch Law (q.v.) became inevitable, and was had recourse to; soon after 1851, vigilance committees were established in the chief towns, and arrested, summarily tried, and hanged convicted thieves and murderers. Gradually a more regularly ordered state of things was established, and the development of the country has since been rapid. In April 1906 a disastrous earthquake, followed by extensive fires, destroyed the greater portion of San Francisco and parts of several other cities.

See SAN FRANCISCO, YOSEMITE; histories of California by Capron (1854), Hittell (1886), Royce (1886), Soule, H. H. Bancroft, Atherton (1914), Eldridge (1915); and other works on the state by Cronise (1878), Nordhoff (1882), Austin (1914), James (1914), Johnson (1915), Chase (1919).

California, LOWER or OLD, is a peninsula and a territory of Mexico, continuous southward from the state of California, and is detached by the Gulf of California and the lower reaches of the Río Colorado from the rest of Mexico. Its reported area is 61,562 sq. m., or more than half the extent of Great Britain and Ireland. The climate is exceedingly dry, and excepting in some of the valleys, agriculture is hardly practicable. The surface of the country is mostly covered with mountains, often rough and broken, but nowhere very high. The whale-fishery on the west coast, and the pearl-fishery of the gulf, are of some value. Mining enterprises have been undertaken at various points, with but moderate success at the best. Since 1880 over 400 mines have been reported as being wrought. Salt is obtained from the Gulf Coast, and chiefly from Carmen Island, and orchil is brought from the dry interior. Sugar is produced in a rude way in some of the fertile valleys. The vintage of El Patroncio is highly esteemed. The capital is La Paz, on one of the bays of the gulf. Pop. of territory, 52,200.

The GULF OF CALIFORNIA, an arm of the Pacific Ocean, which divides the peninsula above described from the rest of Mexico, was originally known as the Sea of Cortez, by whom it was explored. It is 700 miles in length, and varies in width from 40 to 100 miles. At its northern extremity, where it receives the Colorado, it almost touches the territory of the United States.

Caligula, CAIUS CÆSAR AUGUSTUS GERMANICUS, Roman emperor (37–41 A.D.), the youngest son of Germanicus and Agrippina, was born August 31, 12 A.D., at Antium, and was educated in the camp, where the soldiers gave him the nickname Caligula, from the soldier's boots (*caligæ*) which he wore. He ingratiated himself with Tiberius, and on the death of the latter (37 A.D.)—an event which there can be little doubt was either caused or accelerated by him—it was found that he had been appointed co-heir along with the emperor's grandson; but the senate conferred imperial power on Caligula alone. In the beginning of his reign he appeared little likely to fulfil the threat of Tiberius, who had talked of educating him 'for the destruction of the Roman people.' He was to appearance lavishly generous and merciful, pardoning even those who had been the instruments of cruelty against his own family. But this ostentatious magnanimity was itself a disease, an unwholesome affectation, and co-existed with the most savage voluptuousness and lust. Consequently, when illness, the result of his vicious life, had weakened his faculties, the lower qualities of his nature obtained the complete mastery. In

addition to the senseless prodigality with which he commenced his career, expending in one year the enormous wealth left by Tiberius (£5,625,000), he began to manifest the most barbarous propensities. He banished or murdered his relatives, excepting his uncle Claudius and sister Drusilla (with whom he carried on incestuous intercourse); filled Rome with executions, confiscating the estates of his victims; amused himself while dining by having victims tortured and slain in his presence; and uttered the hideous wish that all the Roman people had but one neck, that he might strike it off at a blow! To vie with Xerxes, he constructed a bridge of ships between Baiæ and Puteoli (three miles across), upon which he built houses, and celebrated the exploit by a costly banquet on the middle of the bridge, concluding the entertainment by throwing a great number of his guests into the sea. His favourite horse he made a member of the college of priests, and afterwards raised to the consulship. Finally, he declared himself a god, and had temples erected and sacrifices offered to himself. To gratify his insane desires he shrank from no infamy; he robbed, plundered, and taxed his subjects to a degree which seems almost incredible; and when even these means proved insufficient, he established a brothel in his own palace, and sent out his slaves to solicit the public patronage for it. At length a conspiracy was formed against him, and four months after his return from a plundering expedition into Gaul, he was assassinated 24th January 41 A.D. Doubtless he had long been insane.

Caliph. See KHALIF.

Calippic Cycle. See CHRONOLOGY.

Calisaya Bark. See CINCHONA.

Calisthenics, or **CALLISTHENICS** (Gr. *kalos*, 'beautiful,' and *sthenos*, 'strength'), is a name for exercises for promoting gracefulness and strength, and comprises the more gentle forms of gymnastics, especially for girls.

Calixtines were the more moderate section of the *Hussites*, or followers of John Huss. They took their name from their contending for the giving of the cup (Lat. *calix*) in communion to the laity. For their history, see **HUSS**.

Calixtus, the name of three popes: **CALIXTUS I.** (properly *Callistus*), Bishop of Rome under Heliogabalus and Alexander Severus. According to Hippolytus, his bitter opponent, he was originally a slave, and had twice undergone severe punishment for his crimes before he became a priest under Zephyrinus, whom he succeeded, and who, while Calixtus was yet a deacon, gave him the charge of the *Cœmeterium* on the Appian Way which has ever since borne his name. He was vigorously attacked by Hippolytus (q.v.) for his Patristic views and the laxity of his discipline. —**CALIXTUS II.**, formerly Guido, Archbishop of Vienne, was elected pope at Clugny 2d February 1119. In 1121 he overcame the antipope Burdinus (Gregory VIII.), who was supported by the emperor Henry V., and in 1122 concluded with the emperor the concordat of Worms, which settled the Investiture Controversy. He died on the 13th or 14th of December 1124. —**CALIXTUS III.**, formerly Alfonso de Borja (Ital. *Borgia*), born at Jativa, near Valencia in Spain, was successively counsellor to Alfonso V. of Aragon, Bishop of Valencia, cardinal, and (from April 8, 1455) pope. He laboured in vain to organise a crusade against the Turks, raised to the cardinalate his nephew, Rodrigo Borgia (afterwards Pope Alexander VI.), and died August 6, 1458 (see **ALEXANDER VI.**). — The name Calixtus III. was also assumed by an antipope whom the emperor Frederick Barbarossa

set up in 1168 in opposition to Alexander III., and supported for nine years.

Calixtus, **GEORG** (properly *Callisen*), an eminent theologian of the Lutheran Church, born 14th December 1586, at Medelbye in Sleswick, studied philosophy and theology at Helmstedt from 1603 to 1609, and, after travelling for four years in Germany, Belgium, England, and France, became professor of theology in that university in 1614. His genius, the depth of his knowledge, and the large experience of the world and of men which he had acquired in his travels, developed in him a spirit of great tolerance towards all who held their religious opinions honestly, whatever these might be. Although acknowledged by learned Catholics to be one of the ablest of their opponents, he was, on account of some statements in his work *De Præcipuis Religionis Christianæ Capitibus* (1613) which seemed favourable to Catholic dogmas, and of others in his *Epitome Theologiæ Moralis* (1634) and *De Tolerantia Reformatorum* (1658) which approached too near to the Reformed or Calvinistic standpoint, declared guilty of abominable heresy by the orthodox and dogmatically rigid Lutherans. Calixtus felt keenly that the polemical harshness of Lutheranism was a serious obstacle in the way of a great Catholic Christianity, and that Protestantism must assume another form before it could hope to become the religion of Europe. Under this conviction, Calixtus endeavoured to show that the oldest and most fundamental articles of the Christian faith—viz. the facts embodied in the 'Apostles' Creed'—were common to all Christian sects. Having stated in subsequent dissertations that the doctrine of the Trinity was less distinctly taught in the Old than in the New Testament, and that good works were necessary to salvation; and finally, at the religious conference of Thorn, in 1645, as having been more intimate with the Calvinistic than the Lutheran theologians, he was accused not merely, as heretofore, of blameworthy compromise or 'syncretism,' but of apostasy. Fortunately his friends stood firmly by him, and he retained his professorial chair till his death in 1656. See Henke's monograph (1853-60) and the article in Herzog (1897).

Calkin, **JAMES**, composer, was born in London in 1786, was organist for thirty years to the Regent Square Church, and died in London in 1862. He composed a symphony, an overture, string quartets, pianoforte music, and madrigals.

Calla, an aquatic or marsh-loving genus of *Araceæ* (q.v.), with beautiful white spathes, cordate leaves, flowers crowded up to the extremity of the spadix, and red berries. *Calla palustris* is widely distributed through the marshes of pale-arctic and nearctic regions, and acquires some economic importance in Lapland and parts of Russia (Vitebsk) from the fact that its root-stock, like that of so many other members of the same order, is a wholesome source of starchy



Calla palustris.

matter, used in bread-making, after its acrid and poisonous properties have been removed by washing and cooking. The well-known and beautiful *Richardia æthiopica*, often popularly called 'Lily of the Nile,' was formerly included in this genus, and is often still called Calla.

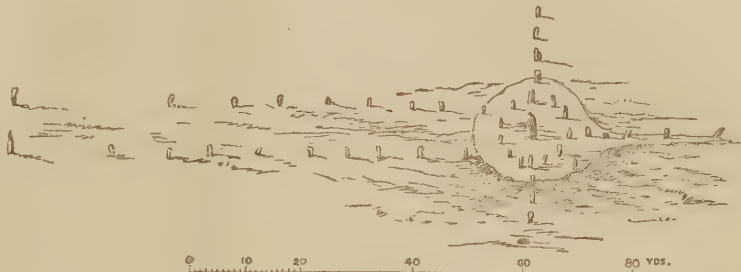
Callander, a Perthshire village on the left bank of the Teith, 16 miles NW. of Stirling by rail. It lies in a beautiful and romantic situation described in Scott's *Lady of the Lake*, and is surrounded by high mountains and Highland lakes. Hence it is much frequented by tourists, who make it a centre to visit Loch Lubnaig, Ben-Ledi, the Trossachs, and Loch Katrine. Pop. (police burgh) 2000.

Callao, the port of Lima, Peru, lies 7 miles SW. of Lima by rail, on a small bay. The streets generally are narrow and the buildings unimportant. The town possesses a floating-dock, while fine harbour-works, embracing an area of 520 acres, with extensive pier and dock accommodation, were completed in 1875; and the spacious roadstead, sheltered by the island of San Lorenzo, is one of the safest in the world. The huge old Spanish fortress is used for custom-house offices. There are sugar-refineries, ironworks, and sawmills; but the place depends chiefly for its prosperity on its trade. The exports are wool, sugar, specie, copper, cotton, bark, hides, guano, and cubic nitre. Population, 53,000. The present Callao dates only from 1746, when the original city, a short distance to the south, was destroyed by an earthquake and an invasion of the sea. Callao was bombarded in 1880 during the war between Chile and Peru, and the annexation by the former of the guano-producing islands materially decreased the exports of this manure; cubic nitre (a government monopoly) and wool come next in importance. By the completion of a direct cable between this port and Mollendo, telegraphic communication was established with the United States.

Callcott, JOHN WALL, composer, was born at Kensington in 1766, and abandoning medicine for music, in 1785 was made Bachelor, in 1800 Doctor, of Music at Oxford. In 1806 he published his *Musical Grammar*; the year after, his mind gave way. He recovered in 1812, but only for four years, when he relapsed, and continued insane till his death near Bristol, 15th May 1821. He was one of the most eminent composers belonging to the British school of music, and especially celebrated for his glees. The best of these were published in 1824, with a memoir by his son-in-law, W. Horsley. —His brother, SIR AUGUSTUS WALL CALLCOTT, landscape-painter, was born at Kensington in 1779, and for six years was a chorister at Westminster. In 1799 he exhibited a portrait at the Academy, and from 1804 devoted himself to landscape-painting. He became an A.R.A. in 1806, an R.A. in 1810, was knighted in 1837, and died 25th November 1844. His landscapes are remarkable for their beauty, clear definition of objects, good drawing, and truthful natural colouring. See Dafforne's *Pictures by Callcott* (1875). His wife, Lady Maria Callcott (1785-1842), was author of *Little Arthur's History of England*, and fourteen less-known works.

Callernish, a district on the west coast of the island of Lewis, 16 miles from Stornoway, remark-

able for its stone circles. There are seven at no great distance from one another, but without any visible relation. The principal one, of which the figure gives a bird's-eye view, is of a more than



Callernish Circle.

usually elaborate design. Two lines of upright stones run parallel to each other in a northerly direction, while a single line of similar stones is projected from the south, east, and west points, thus giving a cruciform figure to the structure, whose extreme dimensions are 408 by 130 feet. A larger stone than any of the others, being 17 feet high, and 5½ feet broad at the base, occupies the centre of the circle, which circle is 42 feet in diameter. The stones themselves are not columnar or shaped into any form; they are simply broad, flat blocks of gneiss—the all-prevailing rock from the Butt of Lewis to Barra Head. There are 13 stones in the circle, including the centre one, 19 in the avenue, 4 in each of the east and west, and 5 in the south arm. The peat, which in the lapse of centuries had accumulated around the base of the stones to a depth of 5 feet, was removed in 1853, when a small chambered cairn was discovered within the circle. See Dr Joseph Anderson's *Scotland in Pagan Times* (1886).

Callichthys (Gr. *kalos*, 'beautiful'; *ichthys*, 'a fish'), a genus of physostomatous bony fishes of the family Siluridae (q.v.), having the body almost entirely covered by four rows of large, hard, narrow, scaly plates. The head is also protected by bony plates. The mouth is small; the teeth are very minute or even absent; two long barbules hang from each angle of the mouth. The twelve species of this fresh-water genus are natives of South America. When the streams or pools which they inhabit dry up, they are said to make their way across the land to some other piece of water. They may also bury themselves in the mud of wet meadows, out of which they are dug. A still more interesting habit is that of making regular nests, generally of leaves, in which they deposit their eggs, near the margin of the water, at the beginning of the rainy season. The male and female unite in watching the nests until the young are hatched. These habits are shared by the species of the allied genus *Doras*, in which the lateral plates are broader, keeled, and spiny.

Calligonum, a genus of leafless Polygonaceæ (q.v.), with large four-winged nuts or achenes. *C. Pallasia* is a succulent shrub common on sandy steppes near the Caspian, where its acid shoots and fruits often serve to allay thirst. A nutritious gum is prepared from its root.

Callimachus, an eminent poet, grammarian, and critic of the Alexandrian period, flourished about the middle of the 3d century B.C. He was born of a distinguished family at Cyrene in Libya; taught grammar and belles-lettres in Alexandria; was a favourite of Ptolemy Philadelphus, and his successor, Ptolemy Euergetes; and was made prin-

cial librarian of the Alexandrian Library. He is said to have written as many as eight hundred works on the most varied subjects, but of these only fragments are extant. His elegies were much admired by Catullus, Propertius, and Ovid. The remains we possess are enough to show that art and learning, rather than genius, characterised his poetry. Of the two largest of his lost poems, *Aitia*, in four books, on the origin of mythical stories, and an epic *Hekale*, considerable fragments have been discovered in recent times, which show him to have had no little skill as a narrator of legends and a realistic word-painter. There are editions of his remains by Schneider (2 vols. 1870-73) and Mair (1921, with translation); of the Hymns and Epigrams, by Meineke (1861) and Wilamowitz-Möllendorf (1897). For fragments discovered later, see the *Oxyrhynchus Papyri*.

Calling the Diet. See ARRAIGNMENT.

Callionymus. See DRAGONET.

Calli'opē ('the sweet-voiced'), the muse of epic poetry and of knowledge in general. She was the mother of Orpheus. See MUSES.

Callir'rhoë, daughter of Achelous and wife of Alcæon (q.v.).

Callis'thenes OF OLYNTHUS, a kinsman and pupil of Aristotle, devoted himself to the study of natural and political history, and accompanied Alexander the Great in his expedition to India. His bold outspoken ways, and his especial displeasure at the adoption of oriental habits and the intended assumption of divine honours, brought him under the king's displeasure, and led to his being put to death on a pretended charge of treason, 328 B.C. Only a few fragments of his historic works remain, and these are not valuable. The *History of Alexander* ascribed to him is evidently a production of the 2d or 3d century A.D., and much more romance than history. See ALEXANDER.

Callis'tratus, an Athenian orator, whose eloquence is said to have fired the imagination of the youthful Demosthenes. For his Spartan sympathies he was condemned to death by the Athenians in 361 B.C., and on his return from exile in Macedonia, was actually executed. Another Callistratus was a grammarian and critic.

Callistus. See CALIXTUS, HIPPLYTUS.

Callitrichaceæ. See STARWORT (WATER).

Callot, JACQUES, engraver, was born at Nancy in 1594, and early devoted himself to art in opposition to his father's wishes. A boy of twelve, he attached himself to a band of Gypsies, and wandered with them to Florence; thence a gentleman sent him on to Rome, where, however, some Nancy merchants recognised him, and induced him to return home. He twice revisited Italy, and the second time (about 1612) became Thomassin's pupil at Rome in drawing and engraving; afterwards he repaired to Florence, where, by numerous spirited etchings, he gained great fame, and engraved for Cosmo II., Grand-duke of Tuscany, a series of plates of court festivals, &c. On his patron's death (1621), Callot returned to Nancy, there to be favourably received by the Duke of Lorraine, and to increase his reputation by a copious series of etchings, including six plates of the siege of Breda. For Louis XIII., who invited him to Paris, he executed etchings of the siege of Rochelle; but he refused to commemorate the capture of his native town, and, declining a pension offered by the king, returned to Nancy, where he died, 28th March 1635. His activity as an artist was marvellous. His realistic engravings, some 1600 in number, are invaluable from the vivid light they cast on the manners of the 17th century. His 'Miseries of War,' a series of eighteen plates,

and his 'Gypsies,' are especially celebrated. See the works on him by J. H. Green (1804), Thäusing (1881), Meaume (1860), Dumast (1875), Houssaye (1875), Vachon (1886), and Bouchot (1890).

Callovian, a division of the Jurassic System (q.v.) on the Continent, represented in England by the Kellaways Rock.

Calluna, or HEATHER. See HEATH.

Callus is the exuded material by which Fractures (q.v.) of bones are consolidated. See CORNS.

Calmar. See KALMAR.

Calmet, AUGUSTINE, a learned Benedictine, was born at Mesnil-la-Horgne, near Commercy, February 26, 1672. Entering the order of Benedictines in 1689, he was successively appointed teacher of philosophy and theology in the Abbey Moyen-Moutier (1698), sub-prior at Münster in Alsace (1704), prior at Lay (1715), abbot of St Leopold (1718), and abbot of Senones in Lorraine (1728). He died at Paris, October 25, 1757. His exegetical writings have been commended by both Roman Catholics and Protestants. The *Commentary on the Bible* (23 vols. Paris, 1707-16), though marred by the author's defective knowledge of the oriental languages, contains valuable researches in biblical antiquities. His *Historical and Critical Dictionary of the Bible* (4 vols. 1722-28)—the first work of its kind—was translated into English, German, and other languages, and has passed through many editions. Of Calmet's other works, a *History of the Bible and of the Jews* (2 vols. 1718) and a *Universal History* (17 vols. 1735-71) are mere compilations; but his *History of Lorraine* (4 vols. 1728) is founded on original researches. See Lives of him by Digot (Nancy, 1861) and Guillaume (*ib.* 1875), and the article in Herzog-Hauck (1900).

Calms, or CALM LATITUDES, are those tracts of the ocean on the confines of the trade-winds (see WINDS) which are subject to total absence of wind for long periods together. Their northern limit varies from 5° to 12° N., and their southern limit from 1° to 3° N. lat.

Calmucks. See KALMUCKS.

Calne, an old-fashioned market-town of Wiltshire, 6 miles ESE. of Chippenham by a branch line (1863). It has a town-hall (1882), a free grammar-school (1660), and a large bacon-curing industry. From the 14th century till 1885 Calne was a parliamentary borough. At a synod held here by St Dunstan in 977, relative to the celibacy of the clergy, the floor of the room gave way, precipitating all but St Dunstan to the ground. Pop. of borough, 3600. Bowood, 2 miles south-west, the seat of the Marquis of Lansdowne, is an Italian edifice by Adam; at Cherhill, 3 miles east, is the spirited figure of a White Horse (q.v.), 129 feet long, cut out in the chalk in 1780, and visible 50 miles off.

Caloeë, another name for Boehmeria (q.v.).

Calomar'de, DON FRANCISCO TADEO, DUKE, a Spanish statesman, was born in 1775 at Ville in Aragon, and becoming Minister of Justice under Ferdinand VII., persecuted the Liberals with cold-blooded cruelty, recalled the Jesuits, reopened the monasteries, and closed the universities. He also secretly favoured the party of Don Carlos, and in 1832, when Ferdinand was supposed to be on his death-bed, prevailed on the king to reintroduce the Salic Law, by which Christina was excluded from the throne. This excited the hatred of the nation; and Ferdinand, recovering, abolished the law. To avoid imprisonment, Calomarde fled to France, where he died at Toulouse in 1842.

Calomel is the popular name of one of the compounds of mercury, Hg, and chlorine, Cl, known to chemists as the subchloride of mercury or mercurous chloride, HgCl. It is prepared by taking two

equal portions of mercury, dissolving one portion in hot concentrated sulphuric acid, H_2SO_4 , which forms sulphate of mercury, HgSO_4 , thereafter adding the second part of the metal, and triturating the whole in a mortar till the metal becomes incorporated with the sulphate of mercury. This mixture is then added to about one-third of its weight of common salt, NaCl , and heated in a retort, when calomel sublimes, and condenses in the cool part of the receiver as a fine white powder. A minute portion of corrosive sublimate which accompanies it is removed by washing with water. Calomel is very dense. It is not soluble in water, and sparingly so in acids. It turns black on the addition of lime-water, potash, soda, or ammonia; and when heated in an iron spoon, or on a knife, it does not char, but rises in vapour, sublimes unaltered, and readily condenses again on any cool surface held near it. By these tests it may be readily distinguished from flour. Although calomel has been more used in British practice than any other preparation of mercury, it is not known to have been employed before the 17th century. It is the most valuable of the mercurial preparations, possessing, in addition to their general properties (see MERCURY), those of a vermifuge and purgative.

Calonne, CHARLES ALEXANDRE DE, Controller-general of Finance in France under Louis XVI., was born at Douay in 1734. He studied law, and having filled successively various offices, was made in 1783 Controller-general of the Treasury. In this capacity he soon gained favour among the courtiers, who had complained of the parsimony of Turgot and Necker. His plan was a simple one; he generously showered on the courtiers and people of influence sums which he obtained by borrowing and increased taxation. This could only last for a time; embarrassments grew on him till the inevitable crisis came; and in 1786, when the people could bear the extraordinary taxation no longer, Calonne advised the king to convoke the Assembly of the Notables, and proposed to abolish many of the privileges of the nobles, such as their exemption from taxes, and to distribute the burden of taxation more equally. The people and the aristocracy demanded a convocation of the States-general, instead of the Assembly of the Notables; but Calonne boldly proceeded with his plan, opened the Assembly of the Notables in 1787, and in a pleasant and florid oration described the general prosperity of French industry and commerce, and brought his speech to a climax by confessing that the annual deficit of the treasury had risen to 115 millions of francs, and that during the time from 1776 to 1786 the government had borrowed no less a sum than about 1250 millions! The Notables, instead of proceeding with Calonne's plan of reorganisation, demanded from him a statement of accounts. Not being able to give this satisfactorily, he was stripped of his dignities and banished to Lorraine. After this, Calonne resided chiefly in England, until in 1802 he obtained from Bonaparte permission to return to France, where, on 30th October, he died in very embarrassed circumstances.

Calophyllum (Gr., 'beautiful leaf'), an important genus of Guttiferæ (q.v.). Some yield valuable timber—e.g. *C. angustifolium* of Penang—and are also a source of valuable resins. Several species supply Tacamahaca (q.v.). *C. Calaba* of the West Indies yields oil from its seeds, and is also a serviceable timber-tree. See POON-WOOD.

Caloric, an old term for a supposed imponderable fluid which was the cause of Heat (q.v.); and used loosely for heat. For Caloric Engine, see AIR-ENGINE.

Calorimeter is an instrument for measuring the specific heat of a body; the determination

being effected by ascertaining the quantity of ice at zero which is turned into water by the transference to it of heat from the body (at a known temperature) under examination. See HEAT.

Calotropolis. See MUDAR.

Calottistes (*Le Régiment de la Calotte*), a society of witty and satirical men in the time of Louis XIV., who were headed by two officers in the king's bodyguard, named Torsac and Aimon. Their name was taken from the word *calotte* (a 'small cap,' worn by monks over the tonsure), and their amusement consisted in sending to any public character who had exposed himself to ridicule, a 'patent,' authorising him to wear the *calotte*, as a covering for the weak part of his head. As the society became audacious, and did not spare even royalty itself, it was dissolved by the minister Fleury. The *Mémoires pour servir à l'Histoire de la Calotte* (Basel, 1725) is an amusing little book. After the Restoration, the title *Régime de la Calotte* was applied to the priestly administration of affairs.

Calotype (Gr. *kalos*, 'beautiful,' *typos*, 'impression') was the name given in 1840 by Dr Fox Talbot to the method of photographing by the action of light on nitrate of silver, invented by him about that date. See PHOTOGRAPHY.

Calovius, ABRAHAM (originally *Kalau*), the chief representative of controversial Lutheran orthodoxy in the 17th century, born 16th April 1612 at Mohrungen in East Prussia, was successively professor at Königsberg (1637), preacher at Danzig (1643), and professor at Wittenberg (1650). He waged war incessantly on Arminian, Socinian, Reformed, and Catholic doctrines, and with the greatest bitterness against Calixtus. 'He was,' says Tholuck, 'formed by nature for a grand inquisitor: hard features, powerful under-jaw, staring eyes.' He was six times married, the last time in his seventy-second year. He died 25th February 1686. His chief writings are his *Systema Locorum Theologicorum* (12 vols. 1655-77), the *Historia Syncrética* (1682), and his great *Biblia Illustrata* (4 vols. 1672).

Calpe, one of the Pillars of Hercules (q.v.).

Calprenède, GAUTIER DE COSTES DE LA (1610-63), a French officer of the guards and royal chamberlain, wrote many tragedies, &c., but is best known as author of the heroic romances—clever but endless and tedious—of *Cléopâtre*, *Cassandre*, and others. See NOVELS.

Calpurnius, TITUS, called Siculus, a Roman poet of the 1st century A.D. whose eclogues closely imitate Virgil's manner. See Postgate's *Corpus Poetarum Lat.* (Fasc. iv., 1904).

Caltabellotta, a small Sicilian town, 30 miles NW. of Girgenti, with an old castle (once Saracen) and a Norman church; pop. 6300.

Caltagirone, a city of Sicily, 38 miles SW. of Catania, manufactures pottery and statuettes of clay, and has technical schools. Ancient Sicel and Greek cemeteries surround the place. Pop. 40,000.

Caltanissetta, a fortified town of Sicily, 83 miles SE. of Palermo by rail. It has a cathedral, mineral springs, and extensive sulphur-works. Population, 42,000.

Caltha. See MARSH MARI-GOLD.

Caltrop, a four-pronged piece of iron, each prong about four inches in length, formerly thrown down in warfare to check the approach of the enemy's cavalry over a plain, or of besiegers in the ditch of a fortification.



Caltrop.

Calumba, or COLOMBO, is the root of *Jateorhiza columba* (or *palmata*), a Menispermaceous climber of Eastern Africa, which has been introduced into India. Sliced and dried, it has a greenish-yellow tint, a very bitter taste, and a faint aromatic odour. Its bitterness and other properties are ascribed to the presence of columbin, berberin, and columbic acid. It is a useful mild tonic and stomachic.—**AMERICAN CALUMBA ROOT** is obtained from *Frasera Walteri*, a gentianaceous biennial, and has properties like those of gentian.

Calumet, the 'peace-pipe' of the North American Indians, is a tobacco-pipe having a stem of reed or painted wood about two feet and a half long, decorated with feathers, with a large bowl, usually of red soapstone. After a treaty has been signed, the Indians fill the calumet with the best tobacco, and present it to the representatives of the party with whom they have been entering into alliance, themselves smoking out of it afterwards. The presentation of it to strangers is a mark of hospitality, and to refuse it would be considered an act of hostility. Originally *calumet* was merely the Norman name for a shepherd's pipe (Fr. *chalumeau*, Lat. *calamus*), which the early French settlers applied to the native pipe from its resemblance; and we find it thus applied by Père Marquette (1673), and in the earlier 'Jesuit Relations' of 1638. See illustration at TOBACCO.

Calumet, a township of Houghton county, Michigan, on a peninsula of Lake Superior, 42 miles N. of L'Anse by rail, including the village of Laurium (q.v.; formerly Calumet), with one of the richest copper-mines in the world—now much reduced. It has produced upwards of 50,000,000 lb. in a single year.

Calumny, LAW AS TO. See LIBEL, SLANDER.

Calvados, a French maritime department of Normandy. The principal rivers are the Touques, Orne, Dives, Seulles, Aure, and Vire. The coast, which has few bays or inlets, is partly formed by bold ridges, and partly by sand-downs, cliffs, and reefs; the dangerous reef extending for 16 miles between the mouths of the Orne and the Vire was called Calvados, after the *Salvador*, one of the vessels in the Spanish Armada shipwrecked here, and from it the department takes its name. The soil is generally fertile, especially in the valleys, supplying rich pasturage for horned cattle, sheep, horses, and swine, which constitute the principal wealth of Calvados. The climate is moist, but healthy. Iron, marble, granite, and coal are found. The chief towns are Caen (the capital), Bayeux, Falaix, Honfleur, Lisieux, and Trouville. Area, 2130 sq. m.; pop. (1861) 480,992; (1891) 428,945; (1921) 384,730.

Calvaert, DENIS, called also DIONISIO FIAMMINGO, painter, was born at Antwerp about 1540, and settled at Bologna. There he opened a school, which numbered among its students the celebrated Guido Reni, Domenichino, and Albani, who afterwards, however, were pupils of the Caracci. Many excellent pictures by him are still preserved at Bologna. He died in 1619.

Calvary, the Anglicised form of the Vulgate *calvaria*, which was the Latin rendering of the Greek *kranion*, as that again of the Hebrew *golgotha* or *gulgaltá*, all three words meaning 'a skull.' Why the scene of the Crucifixion was called 'the place of a skull' has been keenly debated, whether from the skulls of criminals lying about there, or from its being a round, bare, skull-like hillock. The latter is probably the true explanation; though none of the Evangelists offers any warranty for the current phrase, 'Mount Cal-

vary.' It lay beyond but nigh to the city. Consider's identification with 'the old "House of Stoning," or place of public execution according to the law of Moses, on the top of the remarkable knoll outside the Damascus gate, on the north side of Jerusalem, is exploded. It was from this cliff that the criminal used to be flung before being stoned (according to the Talmud), and on it his body was afterwards crucified; for the spot commands a view all over the city; and from the slopes round it the whole population might easily witness the execution' (see JERUSALEM).—In Catholic countries the term Calvary is applied to an eminence crowned with one or three crosses bearing life-sized figures of Christ and the thieves, and surrounded sometimes by a number of figures, representing the various personages who took part in the crucifixion. Along the approach to such a Calvary—the *Via Dolorosa*, the Way of the Cross—are sculptured representations of the Stations (q.v.) of the Cross.

Calverley, CHARLES STUART, the prince of modern English parodists, was the son of the Rev. Henry Blayds, who in 1852 took the name of Calverley, and was born on 22d December 1831. From Harrow he passed to Balliol College, Oxford, whence after a brief period he migrated to Christ's College, Cambridge, where he graduated as second classic in 1856. Within two years he was elected a fellow of his college. In 1865 he was called to the bar, and settled in London, but a fall on the ice in the winter of 1866-67 put an end to what might have been an exceptionally brilliant career. He died at Folkestone on the 17th of February 1884. One of the most gifted men of his time, and unrivalled as a humorist, Calverley will be remembered by his two little volumes, *Verses and Translations* (1862) and *Fly Leaves* (1872). His parodies, particularly that of Jean Ingelow, are the best that have appeared since the *Rejected Addresses*, and the delicacy of his scholarship finds admirable expression in his numerous renderings from Latin into English, and from English into Latin. The translation of Theocritus (1869) shows at once his ripe scholarship and his facile mastery of English verse. His *Literary Remains*, with a memoir by Sir W. J. Sendall, were published in 1885.

Calvert, FREDERICK CRACE, chemist, born in London in 1819, resided in France (1836-46), and settled as a consulting chemist in Manchester, where he died 24th October 1873. His researches in applied chemistry produced valuable results, and he was largely instrumental in introducing carbolic acid as a disinfectant. Besides numerous scientific papers, he published a work on *Dyeing and Calico-printing* (new ed. 1878).

Calvert, GEORGE HENRY, a many-sided American author, great-grandson of Lord Baltimore (q.v.), was born in Maryland in 1803, and studied at Harvard and Göttingen. His works, which exhibit considerable purity of style and originality of thought, embrace poems, tragedies, comedies, essays, translations from the German, and studies of Goethe (1872), Wordsworth (1878), Shakespeare (1879), and Coleridge, Shelley, and Goethe (1880). From 1843 till his death (1889) he lived at Newport, Rhode Island.

Calves'-head Club, an association instituted in contempt of the memory of Charles I., and holding its principal meeting on the 30th January, the anniversary of that king's execution, probably ceased to exist soon after the Restoration, though a meeting under the name—probably a hoax—led to a serious riot in 1735. According to the bitterly hostile *Secret History of the Calves'-head Club*, the founder was John Milton.

Calvi, a fortified seaport of Corsica, on a peninsula in the Gulf of Calvi, 38 miles WSW. of Bastia.

Calvi was captured by the English in 1794, after a siege of fifty-one days, during which Nelson lost an eye; it was retaken by the Corsicans in the following year.

Calvin, JOHN, was born at Noyon, in Picardy, on the 10th of July 1509. His father, Gérard Calvin or Cauvin, was procureur-fiscal of the district of Noyon, and secretary of the diocese. He was one of six children—four sons and two daughters. All the three sons who survived were bred ecclesiastics; and the reformer himself, while still only twelve years of age, was appointed to a chaplaincy in the cathedral church of Noyon. Calvin was educated in circumstances of ease, and even affluence. The noble family of De Montmor, in the neighbourhood, invited him to share in the studies of their children; he was in some measure adopted by them; and when the family went to Paris, in his fourteenth year, he accompanied them. He was entered as a pupil in the Collège de la Marche, under the regency of Mathurin Cordier, better remembered, perhaps, by his Latin name of Corderius. It was under this distinguished master that Calvin laid the foundation of his own wonderful mastery of the Latin language. During this early period, he was distinguished by the great activity of his mental powers, and the grave severity of his manners. His companions, it is said, surnamed him the 'Accusative.'

For a while his attention was directed to the study of law, and his father sent him to the university of Orléans, then adorned by Pierre de l'Etoile, one of the most famous jurists of his day. At Orléans, he continued the same life of rigorous temperance and earnest studiousness for which he was already noted. It was while a law-student in Orléans that he became acquainted with the Scriptures, and received his first impulse to the theological studies which have made his name so distinguished. A relative of his own, Pierre Robert Olivetan, was there engaged in a translation of the Scriptures; and this had the effect of drawing Calvin's attention, and awakening within him the religious instinct which was soon to prove the master-principle of his life. The seeds of the new faith were now beyond doubt sown in his heart, and from this time, although he still continued for a while longer to pursue his legal studies, his main interests appear to have been religious and theological. From Orléans he went to Bourges, where he acquired the knowledge of Greek, under the tuition of a learned German, Melchior Wolmar. He began here to preach the reformed doctrines, and passed over into the ranks of Protestantism, under the slow but sure growth of his new convictions, rather than under the agitation of any violent feeling. Here, as everywhere, his life presents a marked contrast to that of Luther.

He proceeded to Paris in 1533, which at this date had become a centre of the 'new learning,' under the teaching of Lefèvre and Farel, and the influence of the queen of Navarre, sister of Francis I. The Sorbonne itself had not escaped the infection. There was a growing religious excitement in the university, in the court, and even among the bishops. This, however, was not to last. The king was soon stirred up to take active measures to quell this rising spirit; and the result was that Calvin and others were obliged to flee for their lives. After this he repaired for a short time to his native place, resigned the preferment he held in the Roman Catholic Church, and for a year or two led a wandering life, sheltered in various places. We find him at Saintonge; at Nerac, the residence of the queen of Navarre; at Angoulême, with his friend Louis du Tillet; then for a brief while at Paris again. Persecution against the Protestants at this time raged so hotly, that Calvin was no

longer safe in France; and he betook himself to Basel, whence he issued, in the year 1536, the first edition of his *Christianæ Religionis Institutio*, with the famous preface addressed to Francis I. The concentrated vigour and intensity of feeling of this address, rising into indignant remonstrance, and at times into pathetic and powerful eloquence, make it one of the most memorable documents in connection with the Reformation. After completing this great service to the cause of Protestantism, he made a short visit to Italy, to Renée the Duchess of Ferrara. Finally, he revisited his native town; sold the paternal estate, which had devolved to him on the death of his eldest brother; and, bidding Noyon adieu, set out in company with his younger brother and sister on his way to Strasburg. The direct road being rendered dangerous by the armies of Charles V., which had penetrated into France, he sought a circuitous route through Savoy and Geneva.

The result of this journey was memorable for the cause of the Reformation. Arrived in Geneva in the autumn of 1536, he met there his friend, Louis du Tillet, who communicated the fact of his arrival to Farel, then in the very midst of his struggle to promote the Reformation. Farel hastened to see him, and urge upon him the duty of remaining where he was, and undertaking his share of the work of God. Calvin did not at first respond to the call. He was given, he himself says, to his 'own intense thoughts and private studies.' He wished to devote himself to the service of the reformed churches generally, rather than to the care of any particular church. By some strange insight, however, Farel penetrated to the higher fitness of the young stranger who stood before him, and he ventured to lay the curse of God upon him and his studies if he refused his aid to the church of Geneva in her time of need. 'It was,' Calvin said, 'as if God had seized me by his awful hand from heaven.' He abandoned his intention of pursuing his journey, and joined eagerly with Farel in the work of reformation.

Having entered upon his task, he soon infused an energy into it which crowned the struggling efforts of Farel with success. The hierarchical authority was already overturned before his arrival; the citizens had asserted their independence against the Duke of Savoy. The magistrates and people eagerly joined with the reformers in the first heat of their freedom and zeal. A Protestant Confession of Faith was drawn out, approved of by the Council of Two Hundred, and then proclaimed in the cathedral church of St Peter's. Great and marvellous changes were wrought in a short time upon the manners of the people; where license and frivolity had reigned, a strict moral severity began to characterise the whole aspect of society. The strain, however, was too sudden and too extreme. A spirit of rebellion against the rule of Calvin and Farel broke forth; but they refused to yield to the wishes of a party animated by a more easy and liberal spirit than themselves, and known in the history of Geneva under the nickname of Libertines; and the consequence was, that they were both expelled from the city after less than two years' residence.

Calvin retreated to Strasburg, and devoted himself to theological study, especially to his critical labours on the New Testament. Here, in October 1539, he married the widow of a converted Anabaptist.

The Genevans found, after a short time, that they could not well get on without Calvin. His rule might be rigid; but an authority even such as his was better than no settled authority at all; and the Libertine party seem to have been unable to construct any efficient and beneficent form of

government. Accordingly, they invited Calvin to return; and after some delay on his part, in order to test the spirit in which they were acting, he acceded to their invitation, and in the autumn of 1541, after three years' absence, once more made his entry into Geneva.

Now at length he succeeded in establishing his plan of church-government. By his College of Pastors and Doctors, and his Consistorial Court of Discipline, he founded a theocracy, which aimed virtually to direct all the affairs of the city, and to control and modify both the social and individual life of the citizens. The Libertines still remained a strong party, which was even augmented, after Calvin's return, by men such as Ami Perrin, who had strongly concurred in the invitation to Calvin, but who were afterwards alienated from him by the high hand with which he pursued his designs, as well as by their own schemes of ambition. The struggle with this party lasted with various fortune for no less a period than fifteen years, and was only terminated in 1555, after a somewhat ridiculous *émeute* in the streets. Ami Perrin and others, driven from the city, were executed in effigy; and the reformer's authority from this date was confirmed into an absolute supremacy. During the long struggle with the Libertines occurred also Calvin's controversies with Sebastian Castellio, Jerome Bolsec, and, above all, Michael Servetus.

Calvin had become acquainted with Castellio at Strasburg. They entertained at first a warm friendship for each other, and Calvin showed great zeal in assisting Castellio, whose poverty and learning had attracted his sympathy. When he returned to Geneva, he invited Castellio to join him there, and procured for him the title of regent or tutor in the gymnasium of the city. There was little similarity, however, in the characters of the two men, and the diversity of their tastes and views soon became apparent. The learning of Castellio was intensely humanistic; and, as soon as he began to apply himself to theology, he came into conflict with Calvin. In a letter to Farel in 1542 we find Calvin speaking of the freaks of 'our friend Sebastian, which may raise both your bile and your laughter at the same time.' These freaks relate to Castellio's notions of scriptural translation, and his refusal of Calvin's offer to revise the version which he had made of certain parts of Scripture. Then, two years later, when Castellio desired to enter into the ministry, Calvin dissuaded the council from accepting him, on account of some peculiar opinions which he held. These were certain rationalistic views as to the authenticity and character of the Song of Solomon, the descent of Christ into hell, and the doctrine of election. After this Castellio left Geneva for a while; but, soon returning, he attacked the views of Calvin openly. After a violent scene in church, which is painted in Calvin's letters very strongly, he was forced to leave the city. The two old friends, now declared enemies, did not spare each other henceforth. The fate of Servetus drew forth an anonymous publication, attacking with keen logic and covert and ingenious sarcasm the Genevan doctrines. This publication was attributed by both Calvin and Beza to Castellio, and they replied to him in no measured terms, stigmatising him as a 'deceiver and vessel of Satan.'

The controversy with Bolsec belongs to the year 1551. Jerome Bolsec was originally a Carmelite monk, but he had thrown aside the habit, and betaken himself to the practice of medicine in Geneva. He was led to attack Calvin's doctrine of predestination. As soon as Calvin heard of this, he led him to understand that he was not at liberty to question the Genevan doctrine. He and the other clergy dealt with him; but after repeated

disputations Bolsec was found incorrigible, and was sentenced to banishment from the city. He ultimately rejoined the Roman Catholic Church, and revenged himself on Calvin by writing his life in a spirit of detraction and slander.

Of all these contests, however, the most memorable is that with Servetus. A melancholy interest encircles the name of this great heretic, which the criminal tragedy of his death keeps always fresh and vivid in the minds of all who hate intolerance, and who love truth rather than dogmatism. The character of Servetus himself has little to do with this interest. He seems to have been more of a vain, restless, and enthusiastic dreamer than of a calm and patient inquirer. In his very dreams, however, and the vague audacities of his speculation there is a kind of simplicity and unconscious earnestness that wins sympathy. He had entered into various connections with Calvin, even from the time of his early residence in Paris; particularly, he had sent him various documents containing the views fully developed in his work subsequently published under the title of *Restitutio Christianismi* (1553). Calvin never concealed his abhorrence of these views; and in a letter to Farel as early as 1546 he threatens that if Servetus should come to Geneva, he would do what he could to bring him to condign punishment: *Nam si venerit, modo valeat mea auctoritas, vivum exire nunquam patiar*. The history of his seizure and condemnation at Vienne by the Catholic authorities, and especially of Calvin's share in the correspondence which led to his seizure, is very complicated and obscure. It has been maintained that Calvin was the instigator, through a creature of his own of the name of Trye, of the whole transaction; it is *certain* that he forwarded to the authorities, through Trye, private documents which Servetus had intrusted to him, with a view to the heretic's identification, and as materials for his condemnation. Servetus was sentenced to be burned, but effected his escape, and, after several months' wandering, he was found at Geneva. It was his intention to proceed to Italy, where he hoped his opinions might meet with some degree of toleration, and he arrived at Geneva on his way. This is the explanation of an event otherwise unaccountable. Having ventured to church, according to the common account, he was recognised, apprehended, and conveyed to prison by Calvin's order, just as he was about to leave the city. The trial lasted, with various interruptions, for two months. He attacked Calvin with the most foul epithets, and Calvin retorted with a virulence and foulness quite equal to his own. At length, on the 26th of October 1553, sentence was passed upon Servetus, condemning him to death by fire. Calvin used his influence to have the mode of death alleviated, but without success. On the very next morning, the sentence was put into execution. On an eminence at some distance from the city, Servetus was fastened to a stake surrounded by heaps of oak-wood and leaves, with his condemned book and the MS. he had sent to Calvin attached to his girdle; and amid his agonising cries the fire was kindled, and the wretched man expiated his heresy in the flames. Whatever apologies may be urged for this memorable crime, it must remain a mournful and scandalous blot on the history of the Reformation. The disgrace of it has particularly attached to Calvin, but most of the Reformers are no less implicated in it. The wise Bullinger defended it, and even the gentle Melancthon could only see cause for gratitude in the hideous tragedy.

After the execution of Servetus, and the expulsion of the Libertines two years later, Calvin's power in Geneva was firmly established, and he used it vigorously and beneficently for the defence

of Protestantism throughout Europe. By the mediation of Beza he made his influence felt in France in the great struggle that was there going on between the hierarchical party, with the Guises at its head, and the Protestants, led by Condé and Coligny. In 1561 his energies began to fail. He had been long suffering from bad health, though his strength of will and buoyancy of intellect sustained him; but his health grew very much worse, and, although he survived for more than two years, he never regained any vigour. He died on the 27th of May 1564.

Very different estimates have been formed of Calvin's character. None, however, can dispute his intellectual greatness, or the powerful services which he rendered to the cause of Protestantism. Stern in spirit and unyielding in will, he is never selfish or petty in his motives. Nowhere amiable, he is everywhere strong. Arbitrary and cruel when it suits him, he is yet heroic in his aims, and beneficent in the scope of his ambition. His moral purpose is always clear and definite—to live a life of duty, to shape circumstances to such divine ends as he apprehended, and, in whatever sphere he might be placed, to work out the glory of God.

He rendered a double service to Protestantism, which, apart from anything else, would have made his name illustrious: he *systematised its doctrine*, and he *organised its ecclesiastical disciplines*. He was at once the great theologian of the Reformation, and the founder of a new church polity, which did more than all other influences together to consolidate the scattered forces of the Reformation, and give them an enduring strength. As a religious teacher, as a social legislator, and as a writer, especially of the French language, whose modern prose style was then in process of formation, his fame is second to none in his age, and must always conspicuously adorn the history of civilisation.

His famous *Institutio* entitles Calvin to the foremost place among the dogmatic theologians of the Reformed Church. This masterpiece of luminous argument presents a complete system of Christian faith, based on the Protestant principle that the Scriptures are the source of Christian truth. 'Two things there are,' says Hooker in the preface to the *Ecclesiastical Polity*, 'which have deservedly procured him honour throughout the world—the one, his exceeding pains in composing the *Institutions of the Christian Religion*; the other, his no less industrious travails for exposition of Holy Scripture.' His commentaries embrace the greater part of the Old Testament and the whole of the New except the Revelation, and place him in the front rank of expositors of Scripture.—The first collected edition of Calvin's works is that of Geneva (1617), in 12 vols. folio; the second that of Amsterdam (1671), in 9 vols. folio. These have been superseded by a complete critical edition by Baum, Cunitz, Reuss, and Erichsen, which began to appear at Brunswick in 1863, and was completed in 59 volumes in 1900. By the 'Calvin Translation Society' in Edinburgh, his works were collected, translated into English, and issued in 52 vols. (1844–56).

The question as to the first edition of Calvin's *Institutes* is finally settled in the Prolegomena to the Brunswick edition of his works. It was published in Latin in the year 1536, and is now extremely rare. The work was revised and extended by Calvin in numerous later editions, both Latin and French. That of Robert Stephens, in 1559, containing Calvin's latest corrections, was reprinted by Tholuck (Berl. 1835; 2d ed. 1846), who also edited his *Commentarii in Novum Testamentum* (7 vols. Berl. 1833–34; 4th ed., 4 parts, 1864). His letters were published by Bonnet (2 vols. Paris, 1854); in an English translation by Constable and Gilchrist (1855 *et seq.*); and more fully in vols. 10–15 of the Brunswick edition. The libraries of Geneva and Zurich contain the MSS. of about 3000 unprinted sermons and other short

writings by Calvin. Beza's *Vie et Mort de Calvin* (1564, extended 1565; ed. Franklin, 1864) was abridged in Latin (1576). See *Lives* by Bolsoac (1577; ed. Chastel, 1875), Jaques E. May (1657; new ed. 1835), Audin (1840; 6th ed. 1873)—all from the Catholic standpoint; also by T. H. Dyer (1850), Bungener (2d ed. 1863; trans. 1863), Pressel (1864), Viguier and Tissot (1864), Guizot (1873), Goguel (2d ed. 1878), Doumergue (1899), Williston Walker (1906); in German by P. Henry (1835–44; trans. 1849), and by Stähelin (1863); and in Dutch by Penning (trans. 1912). Kampschulte, Catholic Professor of History at Bonn, wrote *Johann Calvin, seine Kirche und sein Staat in Genf* (vol. i. 1869, ii. edited from his remains by Götz, 1899). There is a large literature on Servetus and Calvin, as the works of Porter (1854) and Willis (1877). For Calvin and Geneva, see Galiffe's *Quelques pages d'Histoire exacte, soit les Procès intentés à Genève en 1547–59* (1862), and *Nouvelles pages d'Histoire exacte, etc.* (1876); Roger's *L'Eglise et l'État à Genève du vivant de Calvin* (1867), and *Histoire du Peuple de Genève depuis la Réformation* (4 vols. 1875–77); Schmidt's *Les Libertins Spirituels* (1876); Choisy's *La Théocratie à Genève* (1897). See also REFORMATION and works there cited, and *The Cambridge Modern History*, ii. (1904), and Lindsay's *History of the Reformation*. Noteworthy also are Lobstein, *Die Ethik Calvins* (Strasbourg, 1877), and Pierson, *Nieuwe Studien over Joh. Kalvijn, 1536–41* (Amsterdam, 1883).

CALVINISM is the system of religious doctrine associated with the name of Calvin, and supposed to distinguish the churches more particularly called the Reformed, in contradistinction to the Lutheran and Anglican churches. Calvin's doctrinal views are laid down at length in his *Institutio Christianæ Religionis*, first published in 1536, and finally revised in 1559. It was not till many years later, however, that the name of Calvinism came to be attached to a certain set of doctrinal opinions, and not till the rise of Arminius (q.v.), and the Synod of Dort (q.v.) in 1618, that these opinions may be said to have been polemically marked off from others with which they are generally contrasted, and to which they are recognised as standing in opposition.

The difference of thought expressed in the Arminian and Calvinistic systems is as old as the history of Christian doctrine. In almost every point, Augustine may be said to have anticipated Calvin; while Pelagius and the Eastern divines, such as Chrysostom, represented a type of opinion upon the whole consonant to that which in more modern times has been opposed to Calvinism. In the Roman Catholic Church, since the Reformation, the same opposition of thought has presented itself in the famous contest of Jansenism and Jesuitism.

The main point of distinction in these two systems or modes of Christian opinion is as to the operation of divine grace in the salvation of sinners. In the one system, this operation is considered as predetermined and absolute; in the other, as merely foreseen, and in some sense conditioned. *Predestination and Irresistible Grace* are the great key-notes of Calvinism—its two main points. Others were added in opposition to Arminianism—viz. *Original Sin, Particular Redemption*, and the *Perseverance of the Saints*; but the first of these is not peculiarly Calvinistic, and the last two are merely corollaries from the doctrines of Predestination and Grace. Predestination is, in fact, the one distinguishing doctrine of the system, as it was of Augustinianism, of which Calvinism was merely the revival. The divine will, apprehended as decretive and predestinating, is necessarily *irresistible* in its efficacy, *select* in its objects, and *persevering* in its results. The characteristic of Calvinism, therefore, is that it is a speculative Christian system, springing from a single great principle, carried out rigorously into all its logical consequences.

The Church of England, in its earlier history,

was Calvinistic in its Articles, although medieval and Catholic in its ritual. Puritanism was nothing else than a movement to reduce it altogether to a Calvinistic model. In the reaction which followed this movement, the Church of England, while retaining its original articles, nearly parted with its Calvinistic faith; and throughout the 18th century its chief divines are conspicuously Arminian or latitudinarian. But with the revival of the evangelical party in the end of the century Calvinism revived; and it still maintains, if not an absolute sway, yet a powerful influence over many minds in the Anglican establishment, while it is the professed creed of a great proportion of the dissenters.

The Church of Scotland, along with the other Presbyterian churches in the United Kingdom, and the large bodies of Presbyterians in America, all hold to the Westminster Confession of Faith, the most elaborate and formal expression of Calvinistic doctrine that exists. But, while holding to the same Calvinistic standard, these churches show many varieties of actual opinion; and in the history of Presbyterianism Calvinism has shown a tendency to pass into Rationalism or Unitarianism. This is conspicuously the case in the church of Geneva itself, and in some of the old Puritan churches of America. It still remains, however, as opposed to Arminian, Socinian, or any cognate forms of the same type of doctrine, at least one of the most living and powerful among the creeds of the Reformation.

Calw, or **KALW**, a town of Württemberg, on the Nagold, 35 miles WSW. of Stuttgart by rail, with manufactures of woollen and cotton fabrics, buttons; and cigars, and a trade in timber. Pop. 5000, nearly all Protestants.

Calx is the Latin term for quicklime. As quicklime is produced by heating limestone, the alchemists applied the term *calx* to the substance that remains after a metal or mineral is subjected to extreme heat, and *Calcination* (q.v.) to the process.

Calycanthus, a North American genus of Calycanthaceæ, a small order which connects Ranunculaceæ with Rosaceæ, and of which only a few species are known, natives of North America and Japan. They are square-stemmed aromatic shrubs. The bark of *C. floridus* (Carolina Allspice) affords a substitute for cinnamon.

Calycifloræ, a term introduced by De Candolle, and retained by Bentham and Hooker, to include those natural orders of dicotyledons in which the petals are separate, and the petals, stamens, and carpels borne on a flattened receptacle, as in Discifloræ, but in which the sepals also rise from its edge. As the most important calycifloral orders may be mentioned Rosaceæ, Leguminosæ, Crassulaceæ, Saxifragaceæ, Umbelliferae, Myrtaceæ, Onagraceæ, Cucurbitaceæ, and Passifloraceæ. The name expresses the view that the stamens stand upon a united calyx; the study of development has, however, long ago shown that they really arise as usual from the axis. See FLOWER.

Calydonian Boar. Once upon a time, according to a Greek myth, (Æneus, king of Calydon, the ancient capital of Ætolia, omitted a sacrifice to Artemis, whereupon the goddess, when he was absent on the Argonautic expedition, sent a frightful boar to lay waste his fields. No one dared to face the monster, until Meleager, the son of Æneus, with a band of heroes pursued and slew him. The Curetes laid claim to the head and hide, but were driven off by Meleager. Later accounts make Meleager summon to the hunt heroes from all parts of Greece, among them the maiden Atalanta, who gave the monster the first wound.

Calymene, a genus of the fossil order Trilobites (q.v.).

Calypso, according to Homer, a daughter of Atlas, inhabiting the solitary wooded isle of Ogygia, far apart from all gods and men. Odysseus being thrown upon her island by shipwreck, she treated him kindly, and promised him immortality if he would marry her. He was fascinated by her charms, but unwilling to desert his wife and native land; she detained him seven years, bore him two sons, and on his departure died of grief.

Calyptra. See MOSSES.

Calyptrea, a genus of molluscs, among Prosobranch Gastropods, and sometimes popularly known as Chambered, Cup and Saucer, Bonnet, or Slipper Limpets. The shell is indeed more or less limpet-like, but that ends the resemblance, while even in regard to the shell, the presence of a slight spiral, and of an intumed internal plate for the attachment of the principal muscle, are quite sufficiently distinctive. The shapes vary considerably. Some ten living species are known, mostly from warmer waters, though two are recorded as British. From the chalk deposits, however, three times as many species are known. The name *Ratella*, or Limpet, was formerly mistakenly used to include *Calyptrea* and allied genera like *Galerus* and *Crepidula*. *Pileopsis* (*hungarica*), the Hungarian Cap Shell, is allied, and occurs in the Atlantic and Mediterranean.

Calyx. Although in some flowers the transition between ordinary foliage leaves and the floral envelopes immediately surrounding the stamens and carpels is a gentle and almost insensible one, we can, in the vast majority of cases, recognise the floral envelopes as clearly defined. The outer circle or whorl of these is what we term the calyx, the inner being the corolla; and the separate leaves of the calyx are termed sepals, corresponding to the petals. In most monocotyledons the outer and inner whorls of floral envelopes are essentially similar, and both are usually equally coloured or white; in these cases it is customary to unite them under the common term of *perianth*. In others, and in most dicotyledons, the calyx is green and leafy, and is sharply distinguished from the corolla, to which the floral colour is thus restricted; in other cases, however, especially when the floral envelopes are in a continuous spiral, as in the water-lily, the transition between leafy sepal and distinct petal is quite gradual. The leafy habit of the calyx varies within the widest limits; thus, we have on one hand the vegetative extreme, where the sepals are not only leafy in the flower, and perhaps even possess stipules (strawberry), but persist after the corolla has withered, and even grow up around the fruit, as in the winter-cherry (*Physalis*). Next, we have the most frequent case of ordinary green sepals, which wither or fall off when flowering has been accomplished, or they may drop off at a still earlier stage, when the flower opens, as in the poppy; or again, they may become petaloid, especially when the petals are reduced to nectaries, as in the Christmas rose or monkshood, or have disappeared altogether, as in the marsh-marigold. In the monochlamydeous orders of old classifications—e.g. Polygonaceæ, Chenopodiaceæ—the calyx also alone persists, but is small and inconspicuous; while in the so-called achlamydeous types this also disappears—e.g. willow; or, as probably in *Casuarina* and perhaps in the grasses, it may never have existed in any ancestor. In such cases the protective functions are performed by bracts, which often become reduced in their turn. Thus in grasses the protective glumes are not sepals, as was at first supposed, but bracts, and even the minute scales called lodicules may represent not sepals, but a bracteole.

The calyx is said to be *inferior* when, as in typical unmodified flowers, it occupies its normal place lower on the axis than the other parts, and particularly the ovary; in many cases, however, it is *superior*—i.e. borne upon the summit of the fruit, as in the apple or rose. The explanation of this used to be that an 'adherence' had taken place between the inner surface of the calyx and the outer surface of the ovary, and the term *adherent* was therefore frequently applied to it. Not only, however, is there no evidence in favour of this explanation, but we know, alike from the study of development, from comparative anatomy, and from physiology, that the inferior ovary comes into its place by the checking of the apical growth of the floral axis, which thus becomes cupped instead of pointed. This hollowing of the summit of the axis naturally begins at the point where the leafy sepals and expanded petals mark the limit where vegetation ceases, and the essential reproductive organs take the place of non-reproductive leaves. The apparent sinking of the 'inferior' ovary is, in short, the consequence of the onward growth of the portion of the axis which bears the 'superior' calyx. See FLOWER.

Cam, or GRANTA, a sluggish river of England, which, rising in Essex, flows 40 miles NW. and NE. through Cambridgeshire, and falls into the Ouse $3\frac{1}{2}$ miles above Ely. The name *Cam* is probably a mere figment, manufactured from *Cambridge*; see *Notes and Queries*, May 1901, p. 365.

Cam, DIOGO, a Portuguese explorer of the 15th century, who followed up the course of Prince Henry of Portugal, and in 1482 discovered the mouth of the Congo, near whose bank an inscribed stone erected by him as a memorial was found in 1887. He afterwards examined the coast as far as 22° S. lat.

Camal'dolites, a religious order founded in the vale of Camaldoli, near Arezzo, in the Apennines, in 1018, by St Romuald, a Benedictine monk (died 1027), and which spread from Italy into France, Germany, and Poland. The brethren, who wore a white garment, were always characterised for the excessive rigidity of their monastic rule. Their dissensions early broke them up into several congregations; but in the 18th century, under five generals, they numbered 2000. The order is now almost extinct.

Camargue. See BOUCHES DU RHÔNE.

Camarilla (Sp., 'a little chamber'), a word first employed in the time of Ferdinand VII. of Spain (1814-33), and which now signifies throughout Europe the influence exercised on the state by the court-party, the favourites and sycophants of a pope or monarch, in opposition to the advice of his legitimate ministers.

Camayeu is a term by which painting in one colour, or monochrome, is designated. Pictures of several tints, but where the natural colours of the objects are not copied, are also said to be *en camayeu*. As one colour generally prevails, we speak of blue, red, yellow, green camayeu.

Cambacères, JEAN JACQUES RÉGIS DE, Duke of Parma, and High Chancellor of the French empire under Napoleon, was born 18th October 1753, at Montpellier, where in 1791 he was appointed president of the criminal court. Afterwards, as member of the National Convention, he took a prominent part in sketching the new code of laws, and distinguished himself by his moderation. He denied the right of the Convention to condemn the king, and, when this was done, argued in favour of a reprieve. In 1794, as president of the Committee of Public Safety, he was active in procuring peace with Prussia and Spain. His *Projet de Code*

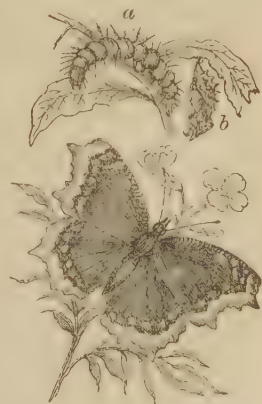
Civil, which afterwards formed the basis of the *Code Napoléon*, was laid before the Council of Five Hundred, of which body he was in 1796 for a short time president. He assisted in the revolution of the 18th Brumaire (November 9, 1799), was appointed Second Consul, and faithfully attached himself to the interests of Napoleon, by whom he was made High Chancellor of the Empire, and in 1808 Duke of Parma. He vainly endeavoured to dissuade the emperor from the projected invasion of Russia; and in 1813, when Napoleon took the field against the allies, he was left as president of the regency. He voted for the abdication of Napoleon. During the Hundred Days, against his own will, he was made Minister of Justice and President of the Chamber of Peers. In 1816 he was exiled for having taken part in the execution of Louis XVI.; but in 1818 his civil and political rights were restored, and he returned to Paris, where he died, March 5, 1824.

Cambaluc (*Khan-Baligh*, 'city of the emperor'), the name by which, during the middle ages, Peking (q.v.) became known to Europe, was rendered familiar by Marco Polo's travels.

Cambay (*Khambhat*), the port and capital of a small Indian feudatory state of Bombay presidency, lies in the north-west portion of the peninsula, at the head of the Gulf of Cambay, 52 miles S. of Ahmedabad. Portions of its brick wall remain, and many ruins still attest its former magnificence and extent. The main cause of its decay has been the gradual obstruction of its seaward navigation. Its principal articles of export are its agate, cornelian, and onyx ornaments, for the manufacture of which the town is renowned. Pop. 30,000; at one time, 200,000. The area of Cambay state is 350 sq. m.; pop. 75,000, of whom about 15,000, including the Nawab, are Mohammedans.—The Gulf of Cambay, a large inlet about 80 miles long and 25 broad, was formerly a great commercial resort; but the shifting shoals and the high spring-tides (rising and falling 33 feet) are troublesome; and as the gulf is silting up, it is now mostly resorted to by craft of 5 to 10 tons burden.

Camberwell Beauty (*Vanessa antiopa*), one

of the largest and most beautiful of British butterflies, rare in Britain, although it has been found in many parts of the country, but common in the central and southern parts of Europe, and having an extensive range in North America, where there are also two varieties, very close to the typical form. The wings are of a deep purplish-brown colour, with a band of black around the brown, and an outer band or margin of pale yellow, the black band containing a row of large blue spots, the yellow mar-



Camberwell Beauty:
a, larva or caterpillar; b, pupa.

gin dappled with black or brown specks, all the colours rich and velvety. The margin of the wings exhibits tooth-like angularities. The antennæ are terminated by a knob. The caterpillar feeds on the willow, elm, and poplar. It is black, with white dots and a row of large red spots down the back, and is rough with soft spines. When Camberwell (now a parliamentary borough in

South London) was a rural place, and abounded in willows, this butterfly was sometimes taken there. *V. Milberti* is a smaller species common in the cooler parts of North America.

Cambium (Lat. *cambio*, 'I change'). The growing point of any stem is composed of one or more actively dividing cells. In the growing point of a fern a single apical cell can still, though with difficulty, be distinguished amid the mass of embryonic cells from which the future tissues are forming, but in higher plants all the cells of this 'meristem,' as it is termed, are equally endowed with the power of division. As the plant grows, the new cells constantly formed behind the apex are modified at first into the embryonic layers from which epidermis, fibro-vascular bundles, and parenchyma are developed, but these are no longer capable of continued growth, and the bundles are said to be definite. Hence monocotyledons and herbaceous dicotyledons do not increase in thickness; but in coniferous and perennial dicotyledonous stems a layer of embryonic cells remains undifferentiated between the wood and bast of the fibro-vascular bundles, and continues in a state of division as the *cambium*. The bundles thus grow in thickness by the differentiation from the cambium layer of new layers of wood and bast which press apart those already formed. (For cut and fuller details, see BARK.) The wood and bark thus undergo an increase in thickness, which is most marked in spring and early summer, but proceeds more slowly towards autumn, and stops entirely in winter. The bundles are thus said to be indefinite, and their seasonal rhythm of growth is recorded in the familiar rings of wood and layers of bark (see BARK and WOOD). These are always easily separable, since the delicate intervening cambium-cylinder gives way much more easily than the formed tissues, leaving, when torn, its thin-walled protoplasmic cells as a moist and viscid layer covering the harder surfaces of these. In thin transverse sections of stems the cambium cells can readily be made out, with their closely parallel walls indicating their plane of division longitudinal and parallel to the outer surface of the stem.

In exceptional cases, a cylindrical layer of meristem may persist outside the fibro-vascular bundles altogether, and immediately under the epidermis and cellular envelope, which become thickened as a false bark or *rind*. From this may be continuously deposited entirely new bundles of definite type, the stem thus increasing in thickness, as in the dragon-tree (*Dracæna*) and other arborescent monocotyledons. In the dicotyledonous *Bougainvillea* also the stem is thickened in essentially the same way. See DICOTYLEDONS.

The layer of embryonic cells from which cork is formed is called cork-cambium by many writers. See CORK.

Cambodia (Fr. *Cambodge*), nominally a state in Indo-China under a French protectorate, but practically a French dependency, on the lower course of the Mekhong, was greatly increased by the treaties of 1904 and 1907, whereby Maluprey, Barsak, Battambang, Siem-Reap, and Sisophon were added, though the adjoining coast-strip was restored to Siam. It is bounded on the SE. and S. by French Cochinchina; on the SW. by the Gulf of Siam; on the N. by Siam; on the E., towards Annam, where the frontier traversing imperfectly explored territories is vague, by the territories of independent Mois tribes. The coast, indented by the bay of Kompong-Som, offers but one port, Kampot, suitable only for river trade. Most of the numerous islands along the coast are inhabited. In the north and west are some extreme ramifications of mountain-chains descending from the

Central Asian plateau; on the north the frontier-chain of Phnum (i.e. 'mountain') Dangrek; and, between the Great Lake and the Gulf of Siam, Crévanh, Tek-Liang, Pang-Chak, Thiang-Ho, Elephant Chain, Bombi Cone; some of them over 3000 feet high. The mountains generally contain iron, limestone, sandstone, and more sparingly, copper. The greater part, however, of Cambodia consists of alluvial plains, completely inundated during the rainy season. In the north-east are schistose forest-clad tracts. The principal river, the Mekhong (in Cambodian, Tonlé-Tom—i.e. 'great river'), flows through Cambodia from north to south as far as Chen-Tel-Pho, and thence south-westwards till, at the town of Pnom-Penh, it divides into two arms, the Han-Giang or Bassac, and the Tien-Giang or Anterior River, both flowing south. Above Pnom-Penh is a north-north-west outlet for the surcharge of the Great River, the Tonlé-Sap (i.e. 'river of sweet-water'), expanding into the Great Lake, 100 miles by 25 miles in extent, with a depth of 65 feet at its maximum magnitude. The periodical risings of the Great River deposit rich mud strata over the surrounding plain to a wide extent. Numerous tributaries discharge into the Mekhong and Tonlé-Sap. Flowing into the Gulf of Siam are Kompong-Som and Kampot. The climate is divided into the rainy season, from April to October, but interrupted in August, and the dry, from October to April. The thermometer ranges from 70° to 104° F., but on the high plateaus sinks as low as 59° F. The natural products are more numerous and varied than in French Cochinchina: rice, the principal cereal, betel, tobacco, indigo, palm-sugar, silk-tree, pepper, maize, cinnamon, coffee, cotton, fruits, &c. The forests contain excellent timber. The fauna of Cambodia comprises the elephant, tiger, panther, bear, rhinoceros, ape, buffalo, &c. Cambodia supplies Cochinchina with a large part of the cattle it consumes. The horses of Cambodia are small and robust, with remarkably large heads. Birds, principally wading birds, abound. Crocodiles are found in most of the rivers.

The area is 26,000 square miles. The population numbered 3,800,000 at the census of 1921, and included, besides several native races, many Chinese and Annamites, a considerable number of Malays, and a few Europeans. Pnom-Penh, the capital, at the junction of the 'Four Arms,' has a population of 90,000 of very mixed race. The Cambodians approach the Malay and Indian types, are less Mongoloid and more nearly resemble the 'Caucasian' type than their neighbours. They are tall and robust, copper-coloured rather than yellow, the skull elongate, the nose, though flat, more prominent than in the Annamite, and the eyes very slightly oblique. Subject for centuries to foreign incursions and mandarin exactions, the Cambodian, long without foothold of his own, and restricting himself to the barest necessities, has grown indolent and passive, the more so that the rich loam yields its abundance for almost no cultivation. The principal industry is the fishing of the Great Lake, beginning in November, and employing thousands of persons. In Kompong-Soai are manufactures of iron. Emeralds and rubies are got in the mountains of Purrat. Salt is worked. The chief outlet for the exports of the country—rice, salt fish, haricots, cardamoms, palm-sugar, skins, tobacco, cotton, mats, silk, gamboge, ivory, tortoise-shell, pepper—is Saigon in Cochinchina, which is in communication by the river Mekhong with the greater part of Cambodia.

The religion of Cambodia is a development of Buddhism, in which the worship of ancestors forms a large part. Instruction is given by

the priests. The common reckoning of time dates from 638 A.D. The Cambodian language has much in common with the other monosyllabic languages of Indo-China, especially those of Siam and Annam. It lacks, however, the varieties of tones, or inflections of voice, by which these discriminate between the different significations of the same monosyllable. The letters are borrowed from the Indian Pali, the parent of all the Indo-Chinese alphabets. Besides the current idiom there is a sort of literary language of Pali vocabules used in official ceremonies. Nominally Cambodia is still a kingdom. The king's younger brother is a general with the title of second king. The whole of the French possessions in Indo-China are now, by decree of 1887, united under the name of Indo-China, with a governor-general at its head, Cambodia having placed over it a resident-general under the governor-general.

The ancient kingdom of Cambodia or Khmer formerly extended over a large part of Indo-China. Buddhism would appear to have been introduced in the 4th century. The Portuguese in the 16th century were the first Europeans to explore the valley of Tonlé-Tom, and to this day descendants of the Portuguese are to be found in Cambodia. Close on the Portuguese followed Spaniards from Manila, and about 1650 the Dutch set up their factories at the mouth of the Mekhong. The Khmer kingdom became dismembered in the 17th century, when Annam took successively Baria, Bien-Hoa, Saigon, Mytho, and Vinh-Long, and in 1715 Chandoc and Hatien. A century later (1812) Siam wrested the provinces west of the Great Lake: Battambang, Angkor, Tonlé-Repon, and Melu-Prey. In 1858 France first appeared in Indo-China. Having made herself mistress of the Annam provinces of the delta of the Mekhong, France on the 11th August 1863 concluded a treaty with the new king of Cambodia, Norodom, placing Cambodia under a French protectorate. This treaty has been superseded by that of the 17th June 1884, under which the king of Cambodia accepts all the reforms, administrative, judiciary, financial, and commercial, which the government of France may deem advisable. Some provinces were added in 1907.

Ancient Sculptures.—The most remarkable feature of Cambodia is the splendid ruins of Khmer architecture. The temples and palaces of Angkor were known to Portuguese missionaries in the 16th century. A graphic account of Cambodia by a Chinese traveller who spent two years (1295-97) in that kingdom, was translated by Abel Rémusat in 1819. In 1858-61 M. Mouhot, a French naturalist, explored the valley of the Mekhong, &c. He was followed by Dr Adolf Bastian. Later, J. Thomson took a plan of Angkor-Vaht, with 30 photographs of it and other places. The French next fitted out two expeditions, the first under Captain de Lagrée (1866), and the second (1873) under Captain Delaporte. The great piles explored number over 50, while the smaller isolated structures are counted by the hundreds. The temple of Angkor-Vaht occupies a larger area than that of Karnak in Egypt, and just as vast are the monuments of Préa-Khan (near Angkor), of Méléa, and of Pontéay-Chma. Those of Baion, Préa-Khan (province of Kompong-Soai), Ta-Prohm, Ka-Kéo, and Ek-dey constitute likewise immense groups. More remarkable than their magnitude and number is their artistic value, the finest productions deserving to be ranked even with the masterpieces of the West. The Khmer structures are characterised by grandeur and unity of design, and are, moreover, for the most part entirely overlaid, profusely but unconfusedly, with delicate ornamentation. In a single temple of Angkor are 1532 columns, and the mountain yielding the stone is 32 miles distant.

The joinings are scarcely perceptible—no sign of mortar, no mark of chisel, the surface as polished as marble. Pale or fallow sandstone, bright-red brick, and Bien-Hoa stone of sombre rusty colour, are blended in the Khmer architecture for polychromatic effect. Among the ruins are massive stone bridges so solidly constructed as to have almost all resisted the periodical inundations and shock of huge tree-trunks hurled against them. The bridge of Spean-Tenk measures 470 feet in length, and has 34 arches. Monuments so vast, so numerous, and so diverse are calculated by Delaporte to range from the beginning of our era to the 15th and 16th centuries, the finest dating from between the 8th and 13th or 14th. The present degenerate descendants of those Khmer architects look up to these structures from which they are now so far aloof as the work of 'angels' or 'giants,' if not the product of spontaneous generation.

See E. Aymonier, *Le Cambodge* (Paris, 1900 *et seq.*) and other works, and for the language, his dictionaries (1874; 1906); Lagrillière-Beaulere, *A Travers l'Indo-Chine* (1900); A. H. Mouhot, *Travels in Indo-China*; J. Moura, *Cambodge* (Paris, 1882); L. Delaporte, *Voyage au Cambodge*; F. Garnier, *Excursions et Reconnaissances* (Saigon), viii., xiii.; Lajonquière, *Inventaire descriptif des Monuments du Cambodge* (1907); Leclère, *Histoire du Cambodge* (1914); Russier, *Histoire Sommaire du Royaume du Cambodge* (1916).

Cambodia River. See MEKHONG.

Camborne, a town of Cornwall, 12 miles WSW. of Truro by rail, has a mining school and very productive copper, tin, and lead mines. Pop. of urban district, 15,000.

Cambrai, a city and first-class fortress of the French department of Nord, on the Scheldt, 128 miles NNE. of Paris by rail. It is well built, with tolerably wide but irregular streets, and many picturesque old houses. Among the principal public buildings are the town-house (partly destroyed in the Great War), archiepiscopal palace, and cathedral, the last rebuilt after the fire of 1859, and also seriously injured in the war. Its predecessor had been partially destroyed in 1793 by the revolutionists. They also disintombled the remains of Fénelon, who was archbishop here, and melted his lead coffin into bullets; a monument to him, however, by David d'Angers, erected in 1826, fortunately survived the fire, and was placed in the new cathedral. The town also contains a college, theological seminary, and library. The manufactures are important, consisting of cambric—so called from its manufacture here—linen thread, lace, sugar, soap, leather, chicory, &c.; and there is a large trade in agricultural produce. Pop. 26,000.

Camaracum, the ancient Cambrai, was one of the chief cities of the Nervii. It was fortified by Charlemagne, and was long governed by its own bishops, to whom the emperor Henry I. ceded it; taken by the Spaniards in 1595, it was delivered to France by the treaty of Nimeguen (1678). The celebrated League of Cambrai against the republic of Venice, which comprised the pope, the emperor, and the kings of France and Spain, was entered into here in 1508; here also in 1529 the aunt of Charles V. of Spain and the mother of Francis I. signed the *Paix des Dames*, by which Burgundy was restored to France, who in return renounced her claims to Artois and Flanders. During 1815-18 Cambrai was the headquarters of the British army of occupation. Some of the most notable fighting in the Great European War (q.v.) occurred here. The town was in German hands most of the time, and a great part of it was wrecked.

Cambrensis, GIRALDUS. See GIRALDUS CAMBRENSIS.

Cambrésis, a district in France, including the

town of Cambrai. For Cateau-Cambrésis, see CATEAU (LE).

Cambria, the ancient name of Wales, the *Britannia Secunda* of the Romans. It is derived from the word Cymry or Kymry, the name by which the Welsh have always called themselves, and appears in 'Cambrian Mountains' and 'Cambrian System.' *Cumbria*, the name of the old British kingdom also called Strathclyde, and *Cumberland* are other derivatives.

Cambrian System. This is the name given to the great series of sedimentary deposits which comes next in order of succession to the Archæan System (q.v.). Wherever the base of these deposits can be seen, the beds are found to rest unconformably upon the Archæan, or, as they are sometimes termed, the pre-Cambrian rocks. There is some diversity of opinion as to the upper limits of the Cambrian. The name was introduced by Professor Sedgwick, by whom it was made to include a great thickness of strata which most geologists now prefer to consider as forming the lower portion of the succeeding Silurian System (q.v.). The classification now generally adopted for the British Cambrian is as follows:

Upper or Olenus zones.....	{ Tremadoc slates.
	{ Lingula flags.
Middle or Paradoxides zones..	{ Menevian group.
Lower or Olenellus zones.....	{ Harlech and Llanberis group,
	{ and basement volcanic series.

The British Cambrian rocks are best developed in North Wales, where they exceed 12,000 feet in thickness, and are also well represented in Shropshire, &c. They consist largely of coarse red and purple graywackes, sandstones, grits, and conglomerates, and grayish blue and green slates and slaty shales; and the same general character is maintained by the rocks of this system in the east of Ireland. In the north-west of Scotland, however, the system, some 2000 feet in thickness, is represented chiefly by dolomite and limestone, with underlying shales and quartzites. It is noteworthy that the fossil fauna of the Scottish Cambrian is of a distinctly North American type, and does not resemble the fauna of the Welsh Cambrian. The Welsh Cambrian strata are largely unfossiliferous—organic remains being met with chiefly in the higher members of the system. The plant-life of the period is very sparingly, if at all, represented, for it seems doubtful if the fucoid-like markings are really traces of plants. Some of these are almost certainly inorganic—mere wrinkles on the surfaces of the beds, while others are not improbably the tracks or trails of worms, crustaceans, &c. One of the forms which have been bandied about between the vegetable and animal kingdoms is *Oldhamia*, some holding it to be a calcareous seaweed, others ranking it with the Polyzoa, while yet others think it is probably of inorganic origin. Animal life, however, is surprisingly well represented, as by sponges (*Protospongia*), early forms of graptolites (*Dictyograptus*), sea-lilies (*Dendrocrinus*), cystideans (*Protocystites*), star-fishes (*Palasterina*), and early types of corals (*Archæocyathus*). Worm-burrows and worm-castings often abound, and crustaceans are plentiful—the modern groups of Ostracods (water-fleas) and Phyllopoa (brine-shrimps, &c.) being represented. The most notable crustaceans, however, are the Trilobites (q.v.), some of which were very minute and blind (*Agnostus*), while others attained a length of one or two feet (*Paradoxides*). The Brachiopods belong almost exclusively to the 'inarticulate' group—the three most characteristic forms being *Lingulella*, *Discina*, and *Obolella*. Four out of the five classes of Molluscs now existing appear in the Cambrian—viz. lamellibranchs, pteropods, gasteropods, and tetrabranchiate cephalopods. The last are re-

presented by straight and curved chambered shells (*Orthoceras*, *Cyrtoceras*) which belong to the family of the Nautilidæ. The lamellibranchs and gasteropods, which attain their maximum in our own day, appear to have been but sparsely present in the seas of Cambrian times, but some of the gasteropods, such as the snail *Pleurotomaria*, are types still living. The same, it may be remarked, is the case with some of the brachiopods (*Lingulella*, *Discina*), which have persisted to the present day. No indubitable traces of vertebrate life have yet been supplied by the Cambrian strata, nor have we any evidence of land or fresh-water forms, although it is quite possible that some of the molluscs may have lived in estuaries or brackish water. The general character of the sedimentary rocks, with their conglomerates, grits, &c., ripple marks, and animal tracks, is indicative upon the whole of shallow-water conditions; and the paucity of corals and of limestones points in the same direction. Although the fauna of the Cambrian is less varied and abundant than that which has left its traces in the succeeding Silurian, yet we cannot but be struck with the fact that the former is relatively so varied. For here in the very oldest fossiliferous strata we have most of the larger divisions of the animal kingdom represented. Hence those who believe in the doctrine of evolution are of opinion that the Cambrian fauna cannot possibly be the earliest, but must have been preceded by a long series of ancestors; and not only so, but that many forms of life must have existed in the Cambrian seas which have left no trace behind them.

Cambrian rocks have been recognised in various other parts of Europe, as in central and southern Sweden, where the strata are not nearly so thick as in the British area. In central Brittany and in the Ardennes they are likewise represented, and they also come to the surface in several provinces of Spain. The most important continental area, however, is that of Bohemia, where the palæozoic rocks and their fossils were studied in great detail by M. Barrande. He divided the strata into several zones, his *primordial zone* having yielded many organic remains, especially trilobites belonging to characteristic Cambrian genera. In North America the Cambrian system comprises an upper series of sandstones, shales, limestones, &c. (*Potsdam*); a middle series of shales, limestones, &c. (*Acadian*); and a lower series of shales, slates, and calcareous strata (*Georgian*). These strata have been recognised in Newfoundland, Nova Scotia, New Brunswick, and in the states of Massachusetts, Vermont, and New York. They appear also in many different places along the Appalachian chain and in the region of the Rocky Mountains.

The Cambrian rocks of western and central Europe are frequently much altered and metamorphosed, while in North America they show over certain wide areas comparatively little alteration—the *Potsdam* sandstone especially being not unlike many 'freestones,' so that it is much used for building purposes. Igneous rocks (diorite, diabase, quartz-porphry, &c.) are associated with the Cambrian in various parts of Europe. Not much can be said as to the physical and climatic conditions of the Cambrian period. The strata, as we have seen, point generally to shallow seas. The main land-surfaces in the European area probably lay towards the north and north-west of the regions now occupied by Cambrian strata. But large islands of Archæan rocks may have existed in middle Europe. The general character of the Cambrian fauna does not justify us in forming any conclusion as to the climatic conditions of the period. All we can say is that there is no evidence to show that the climate of the globe was then differentiated into distinct zones as it is at present.

Cambric, a general term applied to the finest and thinnest of linen fabrics, said to be derived from Cambrai, where such goods were first made. Some of the finest cambrics of the present day are produced in Switzerland. Scotch cambric is really a muslin, being made of cotton with the fibre twisted very hard, to imitate real or linen cambric.

Cambridge, the county town of Cambridgeshire, lies on the winding Cam, 58 miles N. by E. of London, and 76 NE. of Oxford. The town owes its existence to the fact that the hills on each side of the valley of the Cam approach one another in such a way as to make this the most suitable point for crossing the fens. Two important ancient roads, *Akeman Street* and the *Via Devana*, here cross the valley of the Cam, and were guarded by fortifications which used to be identified with *Camboritum*, the outlines of which can still be clearly traced on the north side of the river. In their centre is the artificial mound, now known as *Castle Hill*, which is believed to be later than Roman. The Romans occupied the site, but there is no evidence that they fortified it.

When the Norman castle was built on this site a displacement of inhabitants is recorded to have taken place; but even then the town or village of *Grantabyrge* probably stood on the present site, on the south side of the Cam, where *St Benedict's* tower (see below) seems to indicate that there was a village at any rate in existence. Cambridge was a town of some importance from the Norman conquest onwards, but from the 13th century its history has been merged in that of the university.

The town, as distinguished from the university, has not many features of interest. It possesses a guildhall, corn exchange, free public library, and jail. There is also a fine county hospital founded under the will of *Dr Addenbrooke* in 1743, and an extensive recreation ground named *Parker's Piece*. Amongst the older churches, the most interesting are *St Benedict's* and the church of the *Holy Sepulchre*. *St Benedict's* (or *St Benets*) has a tower which is a fine specimen of the so-called Saxon architecture, with 'long and short' work, and is probably the oldest building now standing in the town. The church of the *Holy Sepulchre*, the oldest of the four surviving round churches in England, was built about 1120-40 in imitation of the church of the *Holy Sepulchre* at Jerusalem. It was unfortunately restored by the *Camden Society* in 1841. The parish church of *Great St Mary's* is also the church of the university, at which all academic services are held. In 1887-90 there was built a Roman Catholic church, dedicated to 'Our Lady and the English Martyrs,' with a spire 215 feet high. The country round Cambridge is somewhat flat and dull; but on the west side the grounds known as 'the Backs' of the colleges are very beautiful, consisting of gardens, meadows, and avenues. The Cam flows through them. Above Cambridge it is a small but picturesque stream. Below it is dull and ugly, but is used for boat-racing. On account of the narrowness of the river only 'bumping races' can be rowed (see *ROWING*). Since 1885 the borough has sent one member to parliament, instead of two as formerly. Pop. (1851) 27,815; (1871) 30,078; (1881) 40,878; (1921) 59,262.

THE UNIVERSITY OF CAMBRIDGE is one of the two ancient institutions of the kind in England. Authentic records of its origin are entirely wanting, and their place has been supplied by fables. It is probable that the true history of the university begins in the 12th century. (On the beginnings of the university system in Europe, see *UNIVERSITIES*.) Certain writs of *Henry III.*, of 1231, are the earliest record of an attempt to introduce discipline amongst the students attending the lectures. It was about this time that the students, who had

previously lived each in his own lodging at his own charges, began to live together in hostels under the rule of a principal. These hostels were named after the saints to whom they were dedicated, the churches which they adjoined, or the persons who built or formerly possessed them. In 1280 there were as many as 27, and some of them contained from 20 to 40 Masters of Arts, and a proportionate number of younger students; but all these hostels decayed by degrees when endowed colleges began to appear. Some were absorbed by the colleges, and some ceased to exist. *Trinity* hostel survived all the rest, and continued till 1540.

A college is an incorporated body of teachers and students enjoying the benefactions of a generous founder. *Peterhouse*, the oldest college in the university, was founded in 1286; and it was between the middle of the 13th and the close of the 16th century that, with one exception, all those royal and religious foundations were endowed which superseded the hostels and now constitute the university. It is by the possession of the college system that the sister universities of Oxford and Cambridge are distinguished from those of Scotland and the Continent.

The colleges were to a large extent modelled on the pattern of the monasteries. In some instances (as *Emmanuel College*) the colleges were united with religious houses already existing. Hence arose some of the peculiarities of the college system, which survived till a very recent date. To this cause is to be traced the condition of celibacy, upon which, with few exceptions, the fellowships were formerly tenable. The final abolition of restrictions as to marriage and as to holy orders (except in the case of offices with clerical functions) took place in 1881, when new statutes were issued by the Cambridge commissioners under the *Universities of Oxford and Cambridge Act, 1877*.

The endowment of university professorships dates from the 16th century. In 1502 *Lady Margaret*, mother of *Henry VII.*, founded the *Lady Margaret* professorship of Divinity. *Henry VIII.* in 1540 founded the five regius professorships of Divinity, Civil Law, Physic, Hebrew, and Greek. The earliest mathematical professorship was that founded by *Henry Lucas* in 1663.

Cambridge was frequently visited by the plague, and university proceedings were suspended by it in 1642 and 1666. In the civil wars the university took the part of the king, and most of the colleges sent their plate to him at Nottingham. *Cromwell* occupied the town in 1643, and the most eminent royalists were expelled from the university.

During the 19th and 20th centuries the university has been reformed to meet modern needs, both by external authority and upon its own motions. Religious tests have been abolished, the field of study has been widened, non-collegiate students (see below) have been admitted, and the examinations, research courses, and degrees have been thrown open to women, but not full membership of the university.

In order to understand the constitution and organisation of the university, it is necessary to bear in mind the fundamental distinction between the university and the colleges, due to the historical conditions of their respective origins. The governing body of the university is the senate, which is composed of persons of the standing of Masters of Arts. The matters of which the senate has cognisance are the management of the property of the university, the courses of study and examinations to be pursued by those who seek a degree, and public discipline and morals. But all proposals submitted to the senate must be approved by the council—a body elected by the resident members of senate. After the Chancellor and High-steward, the chief executive power is vested in the Vice-

chancellor, who is elected annually from among the heads of colleges, but in practice holds office for two years. The Public Orator is the voice of the senate upon public occasions. The Proctors superintend the discipline and morals of all persons *in statu pupillari*; they are present at all congregations of the senate, read the 'graces,' and take the votes. The Registry is responsible for the graces being offered in due form, and has charge of the university records. There are three terms—Michaelmas, Lent, and Easter. To take an ordinary B.A. degree, a student must reside nine terms. The M.A. degree follows, without examination, about four years after. Dissenters are not now excluded from taking degrees, except in divinity. The university sends two members to parliament, who are elected by the graduates.

Each college is governed by its Master and Fellows, or by the Master and Council, a select committee of the fellows. When questions arise as to the interpretation of the statutes, they are referred to the Visitor of the college. The college officers concerned with questions of discipline are the dean and tutor. The Tutor of the college is *in loco parentis* to his pupils; the Dean has the oversight of 'religion and morals.'

There are five classes of students—viz. *Fellow Commoners* and *Noblemen, Scholars, Pensioners, Sizars* and *Sub-sizars*, and *Non-collegiate Students*. The first class (now almost obsolete) are so called from their dining at the Fellows' table; they wear silk or embroidered gowns, and pay heavier fees. The Scholars are members of the foundation, and are elected, after examination, from the pensioners and sizars, or from students who have not yet begun residence. The Pensioners are the great body of students, are not on the foundation, and pay for their own commons—viz. dinners in hall, &c.—and for their rooms. The Sizars are poorer students, selected, however, by examination, who receive free commons and certain money payments, are admitted at lower charges than the pensioners, but wear the same dress, and are no longer subject to the performance of menial offices as they once were. Some of the colleges, especially St John's and Trinity, have very liberal endowments for the sizars. Non-collegiate students are not members of any college, but are entitled to the privileges of members of the university, and are placed under the charge of the Censor of non-collegiate students. The system of non-collegiate students dates from 1869. Before a student can be admitted, he must at nearly all the larger colleges pass an elementary entrance examination. Where there is no entrance examination, the student is required to furnish satisfactory evidence that he is qualified for admission. It is also necessary to deposit a certain sum of money with the tutor of the college as caution money. The Fellows are elected from the students who have distinguished themselves in the Tripos examinations, or in a special fellowship examination. Vacancies are, as a rule, filled up from members of the college, but fellowships are sometimes open to the competition of the whole university. Fellowships vary greatly in value and conditions of tenure at the different colleges. The length of tenure is limited to six years for fellows not holding a university or college office.

About half of the total number of undergraduates have rooms in college; the remainder reside in lodgings, but under the same rules as to discipline. Residence is usually commenced in the October term. The undergraduate in his first year of residence is called a 'Freshman'; in his second year, a 'Junior Soph'; in his third year, a 'Senior Soph.'

The whole business of the university was originally transacted in the most easterly of the two quadrangles that now compose the Library. In

1722-30 the Senate-house was built, and the old Regent-house, which occupied the first floor of the north side of the quadrangle, was thus added to the Library. The continual need of the Library for increased space has led to large additions from time to time. The Library now contains about 1,000,000 volumes and MSS. Under the Copyright Acts it enjoys the right of receiving on demand a copy of every book published in the country. It is distinguished among the great libraries of Europe for the freedom of access to the shelves permitted to readers. The chief treasure amongst the MSS. is the 'Codex Bezae,' or 'Cantabrigiensis,' presented to the university by Theodore Beza in 1581. This is a copy of the Gospels and Acts of the Apostles of about 500 A.D., with the Greek and Latin versions written on opposite pages.

The Senate-house, which stands in a conspicuous position facing St Mary's Church, is used for congregations of the senate, for the giving of degrees, for university examinations, and the like.

The Fitzwilliam Museum is the finest of the modern additions to the university. Viscount Fitzwilliam bequeathed in 1816 £100,000 New South-sea Annuities, the interest of which was to build and support a museum. He left also a very valuable collection of books, paintings, prints, &c. G. Basevi was the architect, but died before the building was completed. The Marlay bequest of works of art (1912) made an extension necessary. Near the Fitzwilliam Museum is the Museum of Classical Archaeology, which contains the best collection of casts from the antique in Britain. The collections of the Cambridge Antiquarian Society are now in the new Museum of Archaeology and Ethnology. The Pitt Press is a church-like structure, built in honour of Mr Pitt in 1831. It contains a part of the university printing-offices. The Observatory, which is situated about a mile from Cambridge, contains some very fine instruments, amongst which is a large equatorial telescope presented by the Duke of Northumberland in 1835. The Solar Physics Observatory, transferred from South Kensington in 1913, is combined with the former astrophysical department of the university. The large group of buildings known as 'The Museums and Lecture Rooms' is devoted to the study of natural science. The most important departments are: (1) the Medical School; (2) the Museum of Zoology and Comparative Anatomy; (3) the Department of Biochemistry; (4) the Anatomy School; (5) the Mineralogical Museum; (6) the Chemical Laboratory; (7) the Cavendish Laboratory of Experimental Physics, the munificent gift of the Duke of Devonshire, chancellor of the university; (8) the Museum of Archaeology and Ethnology; (9) the Botany School; (10) the School of Agriculture; (11) the Molteno Institute of Parasitology; (12) the Physiological Laboratory; (13) the Psychological Laboratory; (14) the Sedgwick Museum of Geology, containing the original collection of Dr John Woodward. The new Engineering Laboratory is near Leys School. The Botanic Garden is farther south.

A particular notice of each college will be found below in its alphabetical place.

[AYERST HALL, a hostel, founded in 1884 to provide an economical education for theological students and others, became extinct in 1896.]

ST CATHARINE'S COLLEGE, long called St Catharine's Hall, was founded by Robert Wodelarke, provost of King's College, in 1473. John Bradford the martyr, Archbishop Sandys, John Ray the naturalist, and two liberal benefactors to the town and university—William Worts and John Addenbrooke—belonged to this college. The present buildings are of the 17th and 18th centuries, the master's lodge being added in 1875.

[CAVENDISH COLLEGE, established in 1873 by an association, was opened in 1876, became a public hostel in 1882, but was closed in 1891. It was sold in 1893 to the Congregational Board of Education for a preparatory educational institute.]

CHRIST'S COLLEGE was originally founded as a school in 1439, under the name of God's House. It was enlarged and refounded as Christ's College in 1505 by Margaret Beaufort, mother of Henry VII. She was also the foundress of St John's College. Among famous members of this college were Leland, Latimer, Milton, Edward King (Lycidas), Paley, and Darwin. The buildings are substantially the same as those built by the foundress and her executors who carried out her plan, but they have been from time to time modernised, and now have an Italian character.

CLARE COLLEGE, founded 1326, under the name of University Hall, by Richard Badew, was refounded in 1338 by Elizabeth, Countess of Clare. Richard III., pretending to be descended from the foundress, claimed the patronage of this hall. Chaucer calls it 'Solere' Hall. The buildings, which are in Jacobean style, are amongst the most pleasing in the university. The college hall, rebuilt in 1693, is described by Steele (*Spectator*, No. 78). Tillotson, Cudworth, Whiston, and Nicholas Ferrar were members.

CORPUS CHRISTI, or BENET COLLEGE, was founded by two guilds of townspeople—the guild of Corpus Christi and the guild of the Blessed Virgin Mary. They had had separate halls, and respectively worshipped at the churches of St Benedict and St Mary. They united in 1352, and a small college was erected by them. Among the members have been Archbishops Parker and Tenison, Sir Nicholas Bacon, Marlowe, Fletcher, Richard Boyle, Earl of Cork, and the antiquary Richard Gough. The original buildings exist with little alteration, but many additions have been made. St Benedict's Church, the oldest in Cambridge, was long used as the college chapel. In 1579 a chapel was built within the college, with a room over it to contain the very valuable library of books and MSS. left to the college by Archbishop Parker. In the event of a certain number of the MSS. being lost, the collection was to pass over to Caius College, and thence, under similar circumstances, to Trinity Hall. The MSS. are guarded with jealous care, and none have as yet been lost.

DOWNING COLLEGE.—Sir George Downing in 1717 left estates to endow a college after the death of his immediate successors. It ought to have been founded in 1764, but owing to opposition and litigation, the charter was not obtained till 1800.

EMMANUEL COLLEGE was founded in 1584 by Sir Walter Mildmay, on the site of a Dominican house. John Harvard, the founder of Harvard University, belonged to Emmanuel; also Archbishop Sancroft, Sir William Temple, and Dr Samuel Parr. The present chapel was designed by Wren. There are good pictures in a gallery attached to the master's lodge, and valuable MSS. in the library.

GONVILLE AND CAIUS COLLEGE was founded in 1348, under the name of Gonville Hall, by Edmund Gonville. In 1353 William Bateman, his executor, moved it to the present site, and changed the name to the 'Hall of the Annunciation of Blessed Mary the Virgin.' In 1558 John Caius, M.D. (q.v.), refounded the hall under the name of Gonville and Caius. It is now usually called simply 'Caius' (pronounced *Keys*). On account of the Tancred medical studentships, this has always been the chief medical college of the university. Among eminent members have been J. Caius, Harvey, Dr Wollaston, Jeremy Taylor, Sir J. Gresham, and Bishop Mackenzie. The buildings are large and handsome, and the parts erected by Dr Caius carefully

planned for health and beauty. The large and picturesque gateway leading to the senate-house, called the Gate of Honour, was built from the designs of Caius after his death. In modern times large additions have been built to the college.

JESUS COLLEGE was founded by John Alcock, Bishop of Ely, in 1496. Henry VII. granted for the purpose the nunnery of St Radegund. Among its members have been Cranmer, Fisher, Bishop of Rochester, Sterne, and Coleridge. The old buildings are beautiful, especially the chapel, originally the church of the nunnery, but adapted by Alcock. It was injured at the time of Cromwell's occupation of Cambridge in 1643, when a certain William Dowsing committed ravages on many of the college chapels. It was repaired at the Restoration, and was carefully restored (1846-49) under the direction of Pugin.

ST JOHN'S COLLEGE is derived from the oldest foundation in Cambridge, for it is on the site of a small hospital for the sick founded by Henry Frost in 1135, and dedicated to St John the Evangelist. It was under the management of Augustinian friars. Hugh de Balsham tried to attach his secular scholars to the religious foundation, but he was unable to secure harmony, and he therefore founded Peterhouse. In 1510 the hospital was converted into the college of St John the Evangelist, in accordance with the will of Lady Margaret Beaufort, mother of Henry VII., who also founded Christ's College and a professorship of Divinity. Henry VIII. appropriated to himself nearly all the estates left by his grandmother to the college, and gave it some smaller estates in compensation. St John's has, however, grown by numerous gifts, and is now second only to Trinity in size and wealth. Among many eminent members may be mentioned Ascham, Burleigh, Ben Jonson, Falkland, Fairfax, Strafford, Prior, Herrick, Richard Bentley, William Wilberforce, Wordsworth, Kirke White, Palmerston, and Samuel Butler. The buildings are very picturesque, chiefly in Tudor and Jacobean styles. They lie on both sides of the river, which is crossed by a bridge somewhat resembling the Bridge of Sighs. A new chapel, designed by Sir G. G. Scott, was opened in 1869. It is in the Early Decorated style, is richly adorned with marbles and carving, and has a lofty and massive tower. The library contains many valuable MSS., and specimens of early printing. There are interesting portraits in the hall and master's lodge.

KING'S COLLEGE was founded in 1441 by Henry VI. His first intention was to endow a small foundation, but he enlarged his plans and connected the college with Eton, from which the scholars were to be transferred, as in the case of Wykeham's colleges at Winchester and Oxford. The buildings were designed on a large scale, but only the chapel was built in accordance with the king's plan. It is the finest specimen in England of the Perpendicular style, and was not finished till about 1536. The fretted roof is a wonderful work of art, being made of great blocks of stone fitted together and balanced on the piers below. The painted glass is fine, and dates from the beginning of the 16th century, except the west window, which was finished in 1879. The other college buildings were originally on the north side of the chapel. The gateway which alone survives is now incorporated with the western quadrangle of the university library. The scholarships were formerly appropriated to scholars of Eton, and no examination was necessary to take a degree, but in 1853 students of King's were admitted to the Tripos examinations; 24 of the 48 scholarships have also been thrown open. These changes have had an admirable effect on the college, and it has greatly

grown in size and influence. Pearson, Waller, Horace Walpole, Walsingham, Karl Pearson, Sir W. Raleigh, and Rupert Brooke were members.

MAGDALENE COLLEGE (pronounced *Maudlin*) was founded in 1542 by Lord Audley on the site of a hostel for Benedictine students, which had been established in 1428, and was given to Lord Audley at the suppression of monasteries. The appointment of the master is still in the hands of the possessor of Audley End as Lord Audley's representative. Among eminent members were Archbishops Grindal and Usher, Samuel Pepys, and Charles Kingsley. Pepys left his valuable library to the college, on condition it was kept intact and separate, and that it should pass to Trinity College if these conditions were broken. The buildings are old, but not of special interest. The chapel, restored in 1847, is of uncertain date. The hall was built in 1519 by the Duke of Buckingham.

PEMBROKE COLLEGE was founded in 1347 by Mary de St Paul, whose husband, Aymer de Valence, Earl of Pembroke, was slain at a tilting match held in honour of her nuptials. Among the members of the college were many bishops, including Andrewes, Ridley, and Wren; the martyrs Bradley and Rogers; Spenser, Crashaw, Gray, and Mason; also William Pitt. The buildings are in part very old, but much rebuilt and restored. The chapel was built by Bishop Wren, in fulfilment of a vow made by him when imprisoned in the Tower, during the Commonwealth, and the architect was his nephew, Sir Christopher Wren.

ST PETER'S COLLEGE, or PETERHOUSE, founded as a hospital at an earlier date, was converted by Hugh de Balsham into an institution 'for studious scholars' in 1280-86. The present chapel was opened in 1632. Parts of Peterhouse are the oldest collegiate buildings in Cambridge. The hall and combination room have been admirably restored. The poet Gray belonged to this college, but migrated to Pembroke, as Crashaw had migrated from Pembroke to Peterhouse. Archbishop Whitgift, Isaac Barrow (afterwards Master of Trinity), Lord Kelvin, and P. G. Tait were members.

QUEEN'S COLLEGE was founded in 1448 by Margaret of Anjou, wife of Henry VI., and re-founded in 1465 by Elizabeth Woodville, wife of Edward IV. Among the names of interest connected with this college, are those of Fisher, Bishop of Rochester and first president, Fuller the antiquary, and Erasmus, who occupied rooms in this college when he came to Cambridge by Fisher's invitation to teach Greek. His rooms are pointed out in the court which is called after him. The buildings are among the most interesting in Cambridge. They were begun in 1448, and 'have suffered less from modern meddling than in most of the colleges.' There are four courts, and the principal one is entered by a massive gateway with octagonal towers at the corners; there is also a square tower at each external angle of the court. The old chapel suffered at the hands of enemies and friends, but was carefully restored in 1861, and is now a lecture room and library. There are interesting portraits in the hall, combination room, and president's lodge.

SELWYN COLLEGE, founded in 1882, was built by public subscription in memory of George Augustus Selwyn, late Bishop of Lichfield, and formerly Bishop of New Zealand. The aim of the college is to supply an economical university education, based upon the distinctive principles of the Church of England.

SIDNEY SUSSEX COLLEGE was founded on the site of a suppressed religious house granted by Henry VIII. to Trinity. Lady Frances Sidney, widow of the Earl of Sussex, left money for the foundation of a college to be called by her name. Her executors obtained the site from Trinity, which

still receives an annual rent from Sidney of £13, 6s. 8d. Oliver Cromwell entered at Sidney College, but left without taking a degree. The college possesses an admirable picture of him attributed to Samuel Cooper, which it received in 1766 from an anonymous donor, afterwards ascertained to have been Mr Thomas Holles.

TRINITY COLLEGE is larger than any other in either Oxford or Cambridge. It was founded in 1546 by Henry VIII., and was formed by the union and extension of several earlier foundations occupying different parts of the site of the college. Amongst these may be mentioned: (1) Michael-house, founded in 1324 by Hervey de Stanton; (2) King's Hall, founded by Edward III. in 1337. Queen Mary added twenty scholarships and began the college chapel. Architecturally the college may be said to date in its present form from the mastership of Dr Thomas Neville (1593-1615). Neville completed the great court, rebuilt the hall, began the court which now bears his name, and erected the fountain in the great court. The library was begun in 1676, after the designs of Sir Christopher Wren. It is of remarkably fine proportions, and contains a very valuable collection of books and manuscripts. During the nineteenth century the chief additions were the New Court (finished in 1825), and Whewell's Courts, which were completed in 1868, and form a splendid monument of Dr Whewell's munificence towards his college. Whewell's buildings, however, in consequence of the form of the site, are somewhat cramped for architectural effect. The interior of the chapel, which till recently was bare and unattractive, has been elaborately restored and decorated (1870-75). The grounds and gardens are of great beauty, especially the fellows' garden and bowling-green.

The Crown appoints the master, and also possesses apartments in the master's lodge which are occupied by His Majesty's judges when on circuit. The college has produced a long series of eminent men, who are commemorated by fine statues and busts in the antechapel and library, and by some pictures, mostly very bad, in the hall. The following may be mentioned: Lord Bacon, Sir Edward Coke, Cowley, Lord William Russell, John Dryden, Sir Isaac Newton (fine statue in antechapel by Roubilliac), Bentley, Porson, Byron (fine statue by Thorwaldsen in library), Macaulay (statue in antechapel), Sedgwick, Julius Hare, Tennyson, A. H. Hallam, Thackeray, W. H. Thompson, Lord Houghton, FitzGerald, the Duke of Devonshire, Jebb, Clerk Maxwell, Galton, and Sir George Trevelyan.

It may be useful to explain that for boating purposes the college has been divided into three clubs—viz. First, Second, and Third Trinity. Second Trinity (now extinct) consisted of scholars and sizars. Third Trinity is confined to those who come from Eton and Westminster. First Trinity includes the remainder of the college.

TRINITY HALL was founded in 1350 by William Bateman, Bishop of Norwich (one of the three founders of Caius College), for the study of civil and canon law. The buildings are in nowise remarkable, but the library contains a good collection of law-books. Bishop Gardiner, Lord Chesterfield, Bulwer Lytton, and Sir Leslie Stephen were members.

Girton (q.v.) and Newnham (q.v.) Colleges for ladies, and the English Presbyterian *Westminster College* (transferred hither from London in 1899) are no part of the university.

See the annual *Cambridge Calendar*, the *Student's Guide to the University of Cambridge*, the *Cambridge Almanac* (for athletics, college societies, &c.), *Dickens's Dictionary of Oxford and Cambridge*, and *Dalkinson's Cambridge Described*. For the several colleges, see *The Cambridge College Series* (1898 et seq.). For all matters

relating to the buildings of the university and the colleges, and for much general history, see Willis and Clark, *The Architectural History of the University of Cambridge* (4 vols. 1886); for the history, biography, and antiquity, see Fuller's *History of Cambridge*; Dyer; Caius; Le Keux' *Memorials of Cambridge* (3 vols. 1880); Cooper's *Annals* (1842-1908); Cooper's *Athenæ Cantabrigienses*; *Graduati Cantabrigienses*; Cooper's *Memorials of Cambridge* (1860); Ackermann's *History of the University of Cambridge* (1815); Huber's *English Universities* (trans. F. W. Newman, 1843); H. Gunning's *Reminiscences of Cambridge from the Year 1780* (2 vols. 1854); W. Everett's *On the Cam* (1866); C. Wordsworth's *Social Life at the English Universities in the Eighteenth Century* (1874); J. Bass Mullinger's *The University of Cambridge* (3 vols. 1873-1911); Rashdall's *Universities of Europe* (1895); the Dean of Ely's *Cambridge and its Story* (illustrated by Railton, 1904).

Cambridge, a city of Massachusetts, virtually a suburb of Boston, from which it is separated by the Charles River, is principally distinguished as the seat of Harvard University (q.v.), and as the home of Longfellow, Lowell, Wendell Holmes, and many other men of letters. Cambridge was first settled in 1630, and is therefore one of the oldest towns in New England. It early became noted for its printing industry, the first book published in the British American colonies (the Bay Psalm-book) having been printed here in 1640. Indeed, the manufacture of books is now one of its leading industries; besides which there are large manufactories of furniture, glass, ironware, tinware, bricks, chemicals, net and twine, sugar, soap, and rubber. Within the limits of the city are comprised the different localities of Old Cambridge, or Cambridge proper, which is distinctively the seat of the university; East Cambridge or Lechmere Point, a manufacturing district; Cambridgeport, where is located the city hall, numerous churches, several banks, a convent, and some manufactories; and North Cambridge. The cemetery of Mount Auburn is partly in Cambridge. Pop. (1870) 39,364; (1920) 109,694. See BOSTON.

Cambridge, GEORGE WILLIAM FREDERICK CHARLES, DUKE OF (1819-1904), was born at Hanover, the only son of George III.'s seventh son, Adolphus Frederick (1774-1850), who was created first duke in 1801. He held a command at Alma and Inkermann; in 1862 was made a field-marshal; and from 1856 to 1895 was commander-in-chief. He married an actress, Miss Farebrother, their children bearing the name Fitzgeorge.

Cambridge Platonists. See LATITUDINARIANS.

Cambridgeshire, with the Isle of Ely, is 48 miles long, $11\frac{1}{2}$ to 33 broad, and 864 sq. m. in area; 92 per cent. is arable land, meadow, and pasture, the rest fens. The surface, except in the south, which is somewhat elevated and on the chalk formations, is flat and thinly wooded, with villages and churches here and there on slight elevations called 'eys' or islands. In a country less level the much-vaunted Gog-Magog Hills, 4 miles SE. of Cambridge, would escape observation. At Upware are beds of the phosphatic nodules called Coprolites (q.v.), which are of great value as an artificial manure. The northern portion of Cambridgeshire forms part of the Bedford Level (q.v.). The chief of the sluggish rivers are the Ouse, which crosses the middle of the county from west to east, with its tributary the Cam; the Nene, which borders the county on the north; and the Lark. These are all navigable to a certain extent. Cambridge is an agricultural county. In the higher parts the land produces fine crops of beans and wheat. Many cattle and sheep are now supported on the thin chalky soils. The black spongy soil of the fens consists of mud mixed with decayed vegetable matter, and when drained and burned, pro-

duces, in dry years, heavy crops of cole-seed, wheat, oats, barley, hay, potatoes, hemp, and flax. Horses, cattle, and sheep are also reared in the fens. The Isle of Ely, part of the fen-tract, and within the Bedford Level, is famed for garden vegetables, and the meadows of the Cam yield fine butter and cream-cheese. The chief towns of Cambridgeshire are Cambridge (the county town), Ely, Wisbeach, March, Thorney, Linton, Soham, Newmarket, and Royston. The manufactures of Cambridgeshire are mostly such as belong to an agricultural county. Till 1918 Cambridgeshire returned three members to parliament. It now returns one. Pop. (1801) 89,346; (1871) 186,906; (1921) 203,372, including 73,778 in the administrative county of the Isle of Ely. Cambridgeshire was anciently the seat of a powerful tribe—the Icenii. It was crossed by several British and Roman roads, in some parts now covered by several feet of peat-soil. Remains of Roman camps, sea embankments, and villas occur, and Roman antiquities, as coins and urns, have been found. Of four great dykes or earthworks the chief is the Devil's Ditch, extending 7 miles south-eastward from Reach to Wood-Ditton. It is 18 feet high on the east side, and was certainly of pre-Roman workmanship, as it is cut through by Roman roads. In the 9th and 10th centuries Cambridgeshire was the scene of severe contests between the Danes and English. The Isle of Ely and its monks withstood William the Conqueror for three years (see HEReward). Cambridgeshire, and especially the Isle of Ely, suffered much in the civil wars of Stephen, John, Henry III., and Charles I. There formerly existed thirty-six religious houses in Cambridgeshire. See Arthur G. Hill's *Cambridgeshire* (1882), Babington's *Ancient Cambridgeshire* (1883), and Conybeare's *History* (1898).

Cambuscan, a prince of Cambaluc (Peking), whose name is a corruption of Genghis Khan, while the description applies apparently to his grandson, Kublai Khan. 'Cambuscan' was Milton's form of the 'Cam'bynskan' of Chaucer's fragment of a metrical romance, *The Squires Tale*. The lines in *Il Penseroso* (109-15) will be remembered:

Or call up him that left half-told
The story of Cambuscan bold,
Of Camball, and of Algarsife,
And who had Canace to wife,
That owned the virtuous ring and glass,
And of the wondrous horse of brass
On which the Tartar king did ride.

Spenser adds to the tale in his *Fæerie Queene* (IV., ii. and iii.); and John Lane, a friend of Milton's father, wrote a continuation of it. Some of the romantic elements in it are widespread in oriental story, occurring in the *Arabian Nights*, the *Panchatantra*, and elsewhere. See Clouston's *Popular Tales and Fictions* (1887).

Cambuslang, a large mining village of Lanarkshire, 4 miles SE. of Glasgow. Here a revival, known as the 'Cambuslang Wark,' was held, under Whitefield, in 1741.

Camby'ses (*Kambujiya*), second king of the Medes and Persians, was the son of Cyrus, and succeeded his father in 529 B.C. He put his brother Smerdis to death, and in 527 or 525 invaded Egypt, defeated its king Psammenitus at Pelusium, and in six months made himself master of the whole country. He meditated further conquests, but the Tyrian mariners refused to serve against Carthage; an army which he sent to take possession of the temple of Ammon perished in the desert; and one which he led in person to Nubia purchased some conquests dearly at the price of myriads of lives. Camby'ses, according to Sayce, was conciliatory on the whole towards the Egyptians; but latterly he gave himself up to drunkenness and hideous cruelties, when news came, in 522, that Gaumâta,

a Magian, had assumed Smerdis' character, and seized on the Persian throne. Cambyses marched against him from Egypt, but died on the way in Syria from an accidental wound in the thigh.

Camden, a city and port of entry of New Jersey, and capital of Camden county, stands on the left bank of the Delaware River, opposite Philadelphia, with which it is connected by five steam-ferris. It is the terminus of six railways, and has several shipyards and dry-docks, important foundries, cotton and woollen mills, and large manufactures of machinery, ironwares, paints, oil-cloths, &c. Pop. 116,000.

Camden, CHARLES PRATT, EARL, a younger son of Sir John Pratt, who was Chief-justice of the Court of King's Bench in the reign of George I., was born in 1713. Educated at Eton and Cambridge, he was called to the bar in 1738, but not until 1752, when he defended a bookseller successfully against a government prosecution for libel on the House of Commons, did his prospects appear very promising. He was appointed Attorney-general in 1757, and Chief-justice of the Common Pleas in 1762. Judge in the trial of Wilkes, he declared his opinion emphatically that the action of government in this case, by general warrants, was altogether illegal—an opinion which, chiming in with public sentiment at the time, made him the most popular of judges. In 1765 he was created Baron Camden by the Rockingham administration, to whose ill-advised American policy, and to that of their successors, as well as to their treatment of Wilkes, he, notwithstanding, offered constant opposition. He was made Lord Chancellor in 1766, but his consistent principles on these two subjects led to his resignation in 1770. His judicial career ended here; henceforth he was entirely a political character. He filled the office of President of the Council in the second Rockingham cabinet in 1782, and also, under Pitt, from the following year until his death, April 18, 1794. He was created Earl Camden and Viscount Bayham in 1786.

Camden, WILLIAM, scholar, antiquary, and historian, was born in London, where his father was a painter, 2d May 1551. His education, commenced at Christ's Hospital, was completed at St Paul's School and at Oxford. In 1575 he was appointed second master of Westminster School; and it was while discharging the duties of this office that he undertook the work which has made his name famous, his *Britannia*, a survey of the British Isles. Written in elegant Latin, it was first published in 1586, and at once brought him into communication with the learned men of his time. In 1607 the work reached a sixth edition, being greatly enlarged and improved by the indefatigable industry of the author. The book, at first but a comparatively small single volume, has received much additional matter from other writers. It was first translated by Philemon Holland, and the latest and best translation is that by Gough and Nichols (2d ed. 4 vols. 1806). Of this great work of Camden, Bishop Nicolson said it was 'the common sun whereat our modern writers have all lighted their little torches.' In 1593 Camden was appointed head-master of Westminster School; and four years later he was made Clarencieux King-at-arms, an appointment which gave him more time for the pursuit of his favourite studies. His other most important works, all in Latin, are a list of the epitaphs in Westminster Abbey (1600), a collection of old English historians (1603), a narrative of the trial of the Gunpowder plotters (1607), and *Annals of the Reign of Elizabeth to 1558* (1615). He died in his house at Chislehurst (it was afterwards Napoleon III.'s) on 9th November 1623, at the age

of seventy-two, and was buried in Westminster Abbey. He endowed a professorship of history at Oxford. The 'Camden Society' was founded in his honour in 1838 for the publication of early historical remains.

Camel (Lat. *camelus*; Heb. *gámdl*), a genus of even-toed ruminant Ungulates (Artiodactyla, Ruminantia), and type of a small family—Camelidæ or Tylopoda. In this family the dentition is peculiar, for of the three front teeth present in the young only one (the third) generally remains and looks like a canine; the upper lip is hairy and deeply cleft; the neck is very long, though the number of vertebræ remains as usual seven; the feet (with two toes) are not enhoofed, but provided with callous soles. Fig. 1 represents the bones of the lower part of fore-leg, showing the two toes and slightly divided metatarsal bones. The stomach has three compartments, the manplies or psalterium being absent; the placenta is diffuse. The family includes two genera—the Camels proper (*Camelus*) and the various forms of Alpaca (q.v., Auchenia). The camels are well known for their large size, for their dorsal humps, for their callosities on knees, breast, &c., for the common sole uniting the two toes. The ears are small and rounded; the short tail bears a terminal switch; the hair is tangled and felted; the male may protrude a curious pouch from the skin of the mouth at the reproductive season; the period of gestation is prolonged for eleven to thirteen months; a single young one is born; the diet is wholly vegetarian. Camel's blood has oval corpuscles (see BLOOD).

One species (*C. dromedarius*) is usually spoken of as the dromedary, though the title properly belongs only to a special breed. It has a single hump and a generally reddish-gray colour. This familiar 'ship of the desert' has its home in Arabia, is bred in West Asia and North Africa, and is literally indispensable to the Arabs. There are many breeds, and the dromedary *par excellence* is the most agile of these. Apart from its use in transit and transport, the flesh is eaten, the milk made into butter and cheese, the hair woven into fabrics of various degrees of fineness, the skin tanned, the dung burned as fuel; the soot of the burnt dung was formerly a source of sal-ammoniac. The dromedary is found as far east as India, whence twenty-four were imported into Australia for Burke and Wills's exploration (1860); in Western Australia alone about 4000 were in use for various purposes in 1896, and about 6000 in 1921. It has also been introduced into parts of North America, and even into Europe. The other camel is technically known as *C. bactrianus*, and is distinguished by its slightly larger size, two dorsal humps, and somewhat finer brown or reddish hair. This camel is bred in Central Asia, and in its adaptability to domestication, as well as in its natural adaptation to desert life, is a most useful animal. Its frugal diet, its powers of storing water and of going long without a fresh supply, and its great strength, are very familiar facts. The sole uniting the toes, the callosities on chest and joints, the long sheltering eyelashes, the closable nostrils, the capacious water-pouches of the stomach (for the sake of which the Arabs at a pinch are said to sacrifice the camel), the reserve-supply of fat in the humps, the acute senses of sight and smell, are all interesting items in the adaptation of the camel to its life and work. The animal is peculiarly hardy, and can pass the rigours of a Siberian winter without apparent



Fig. 1.

discomfort. Its coat becomes longer in winter. The shaggy undersized camels that drag sleighs over the deep snow of the Kirghiz steppes are very unlike their more southern relations. A camel will eat



Fig. 2.—Camel (*Camelus bactrianus*).

almost any herbage or green thing it comes across, even dried leafless twigs. The soles of the feet wear into the quick; and Gilmour (in his *Mongolia*) tells us that they have often to be patched with leather, fastened by thongs drawn through the wool and cotton the warp of the famous Persian camel's-hair cloth. The so-called camel's-hair brushes are made of hairs from the tail of the sable or of some kinds of squirrel. Coarser camel's wool or hair is imported for various purposes.

The Bactrian camel can carry 1000 lb. weight or more, and the dromedary

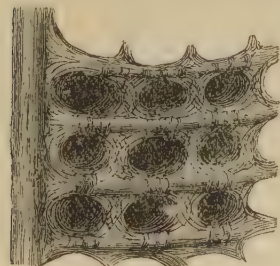


Fig. 3.—Part of the inside of Stomach-paunch of Camel, showing the water-cells.

proper can cover 100 miles in a day. The ordinary jog of a camel is about 2½ miles an hour, but this can be kept up for many days with little food and less drink. A swift dromedary may go 10 miles an hour. A thousand or more may journey in a caravan, and the amount of food carried is surprisingly small. The hump must be in good condition before starting. Sir Samuel Baker says an Arabian camel carrying a load of 400 lb. requires water every third day, or every 90 miles, though they should be watered daily, if possible; but in cold weather, or when not at work, they can remain much longer without any water. If not watered for three days, however, many suffer, unless specially trained. In the stomach-reservoirs a gallon and a half can be stowed away. Like some other frugal animals, the camel enjoys a long life of thirty or forty years. The swinging and jolting gait of the camel renders riding it (on a sort of platform on the hump) a severe ordeal for the uninitiated. The camel's burden is usually disposed on both sides of its back. The Kirghiz yoke camels to a kind of cart; and in Orenburg and elsewhere yokes of four camels may be seen ploughing.

In disposition the camel is peculiarly stolid, not to say stupid. Whether domestication has been too much for it, there can be no doubt that its 'docility' is more the result of habitual nonchal-

ance than any outcome of intelligent subservience. It is usually very submissive, except when habitually thwarted or ill-treated, and during the breeding season; but it is often obstinate and vindictive.

Large fossil camels have been dug out from the Tertiary strata of the Siwalik Hills of India, and from the Quaternary deposits of Algeria. Professor Cope has traced a long line of descent from the Miocene *Poebrotherium* to the modern forms, and primitive forms have been described by Marsh and others from the Eocene strata. The former distribution of the family seems to have been much wider than the natural habitat of the forms now extant. The camel is often mentioned in Scripture, and appears on the sculptures of Assyria. Napoleon used camels for military purposes in Egypt; a camel corps is part of the Egyptian army. Prejevalsky reported wild camels from the deserts east and north of Lob Nor in Chinese Turkestan; and Sven Hedin found them in the same region. They closely resemble the domesticated Bactrian camel, and are probably its descendants.

Camel, a caisson-like apparatus for rendering a vessel navigable in shoal water. It was invented by the Russian engineer De Witte (1790-1854). See CAISSON.

Camelford, a quaint little Cornish town, near the source of the Camel ('crooked brook'), 15 miles W. of Launceston. Within 3 miles is the traditional scene of Arthur's last battle.

Camelina. See GOLD OF PLEASURE.

Camellia, a genus of Theaceæ or Ternstroemiaceæ (q.v.), named after Kamel, a Moravian Jesuit, who in 1639 collected plants in the Philippine Islands. The species are all oriental evergreen shrubs, and have long been cultivated in China and Japan, chiefly on account of the singular beauty of their flowers. The best known and most esteemed of these is *C. japonica*; in the wild state this has



Camellia japonica.

red flowers, recalling those of the wild rose; and in cultivation it yields new florists' varieties from seed, and also furnishes a stock on which to graft them. It was introduced into Europe by Lord Petre in 1739; but double varieties were only brought from China from 1792 onwards: many have also been raised by European florists, and the multitude of beautiful hybrids and varieties is now endless. Camellias may be propagated also by cuttings or layers, as well as by grafting or inarching. The soil suitable is a loose black mould,

which may be prepared by mixing a little sand and peat with loam; and they must be watered liberally, yet with caution to avoid excess. The pruning also, which is performed in spring immediately after flowering, requires judgment, since it must be tolerably close, yet avoid extreme severity. In China and Japan the camellia is cultivated in the open air; and in the very similar climate of the Channel Islands this is also possible. In the south of England some of the hardier varieties can be trained on walls in sheltered localities with a little protection in winter; they may also be grown as window-plants, yet for practical purposes of cultivation on any adequate scale, a greenhouse is required. Care, however, must be taken to avoid much heat, else the flower-buds will drop off. From the hardy and beautiful *C. reticulata* not a few of the varieties now in cultivation are partly derived.—*C. oleifera* and *drupifera* are cultivated in China for the sake of the wholesome oil expressed from their seeds, which much resembles olive-oil. The fragrant flowers of *C. Sasanqua* (Sasanqua Tea) are used for flavouring certain kinds of tea. Like other species, its leaves also afford a kind of tea; in fact the true tea-plant (*Thea*) is practically a camellia. See TEA.

Camelopard (*Camelopardalis giraffa*), an old name for the giraffe, which recalls the curious old notion that certain strange animals originated very simply by crossing. The giraffe was supposed to spring from the camel and the leopard (*pardalis*). See GIRAFFE.

Camelot, a name applied in the medieval romances to the splendid 'City of Legions' which grew up out of the permanent quarters of the Second Augusta Legion at Caerleon-upon-Usk (q.v.), but was built earlier by the mythical Belinus. The name is familiar to readers of Tennyson.

Camel's Thorn (*Alhagi*), a genus of Leguminosæ (q.v.). The species are herbs or undershrubs, and chiefly inhabit the deserts of the East, where they are of great importance as affording food for camels. Several species, notably the herbaceous *A. camelorum*, yield a kind of oriental manna, which appears in the form of drops, as of honey, on the leaves, and gradually hardens. It is imported into India from Kabul and Kandahar. See MANNA.

Cameo. A cameo is an engraved gem in which the figure or subject is carved in relief, in contradistinction to the other form of gem—an *Intaglio* (q.v.), in which the engraved subject is sunk or hollowed out like a seal. The latter is the more ancient form of gem, having been originally devised and used principally as a signet, whereas the cameo came to be employed for ornamental purposes and as a charm. While intaglios were commonly cut into stones of uniform colour, such as the sard, stratified agates were the medium chiefly employed for cameos, the relief being formed in one band or stratum of the agate, with a background of contrasting colour. Regarding the derivation of the name (the Italian form of which is *cammeo*), there is unusual diversity of opinion and many fanciful suggestions; but there does not appear to be any necessity for going behind the base Latin term *cameus*, the onyx, that stone being the principal material from which cameos were originally cut.

The art of cameo-cutting was not practised till after the era of Praxiteles, and it was in the courts of the successors of Alexander the Great that classical cameos were chiefly sought after. The stones used by the ancient engravers were obtained from the east, and many of them were of surprising size and perfection of form and colour. These banded agates are known generically as onyx stones; when the alternate layers are simply white and dark

neutral tint or black they are called simply onyxes; a sardonyx consists of strata of white and ruddy brown sard; in the same way we have chalcedony onyx or chalcedonyx (white and translucent gray), jasper onyx, bloodstone onyx, &c. Frequently three differently coloured layers are available to the engraver in the same stone, and these are taken advantage of to obtain the ground in one colour, the figure in a second, and wreaths or other accessories in the third. When cameo-engraving first flourished, the most artistic products were highly prized, not only for personal ornaments, but for the adornment of cups, caskets, vases, candelabra, and other objects of domestic luxury. Patera and other vessels were frequently worked out of a single stone, around which were engraved a whole series of figures in the most exquisite and accurate taste. A vast number of genuine antique cameos have been preserved in fine condition, and are now deposited in various famous public and private collections. Among these ancient art works several have the highest value for artistic excellence, while others are famous for size and for long and romantic histories attaching to them. One of the most celebrated in all respects is the Gonzaga or Odescalchi cameo (fig. 1), a sardonyx of three strata, measuring



Fig. 1.

6 by 5 inches, formerly in the possession of the Empress Josephine, and now preserved in the imperial cabinet at St Petersburg. It was formerly supposed to represent Ptolemy I. and his wife Eurydice; but the portraits have now been identified as those of Nero and Agrippina. Of not less artistic worth is the smaller cameo of Jupiter fighting the Titans, the work of Athenion (50 A.D.), signed in relief by the artist, preserved in the Vatican (fig. 2). For size and historical interest the two most important classical cameos are the Ste Chapelle cameo—the apotheosis of Augustus, now in the Bibliothèque Nationale, Paris, and the Gemma Augustea in Vienna.

The art of cameo-cutting was revived with the general renaissance of the arts in Italy in the 15th century, and it continued to be practised with great success till comparatively recent times, the last of the long line of famous engravers in precious stones having been Pistrucci, who executed works of very great beauty for the English mint. The imperfect supply of fine onyxes, and the difficulty of treating hard stones, led the modern cameo-cutters in Italy and elsewhere to seek other media for their work,

and shell-cameos were by them introduced. The shells, like the stones chosen for this purpose, are such as possess layers of different colours. The



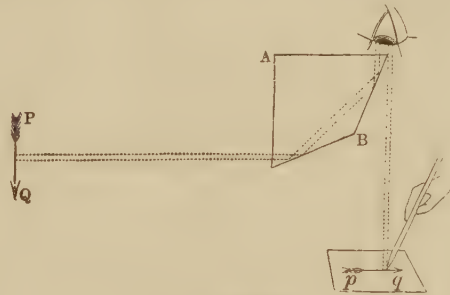
Fig. 2.

most useful are the *Bull's Mouth*, the under layer of which is red, resembling the sardonyx; the *Black Helmet*, which has a dark onyx ground; and the *Queen's Conch*, whose ground is of a pinkish hue. These shells have three strata, the undermost of which forms the ground, the figure being sculptured in the second, and the third serving to mark the hair, wreaths, armour, and other more prominent objects. The portion of shell having been prepared of the requisite size, form, and thickness by various mechanical means, it is fixed by some adhesive substance—usually rosin—to a small block of wood of such form and thickness as to be conveniently grasped by the artist in his left hand. The outline of the object or objects to be represented is then sketched with a pencil, and, in the case of portraits, is usually copied from a previous pencil-sketch on paper. The pencil-marking on the shell is then followed with a scratch-point, and the surrounding white substance is removed by means of files and gravers. This latter process, which is more mechanical than the rest, is usually performed by an assistant. The artist then proceeds slowly and carefully to work out his subject by the use of smaller tools; those used at last for deepening the finer lines being scarcely larger than ordinary darning-needles. The manufacture of shell-cameos hardly ever attained to the dignity of art; and it, combined with the forgeries and frauds in spurious antiques of the latter part of the 18th century, had much influence in causing the decline and present extinction of gem-cutting.

Imitation cameos termed pastes are made in glass of different colours, the figures or subjects being formed in moulds, in soft fusible glass, by the aid of heat, and cemented to the background. Sometimes both background and subject are fused together. James Tassie (q.v.), a Scottish artist working principally in London, formed a collection of about 20,000 moulds from antique and modern gems for such pastes, and a very full collection of his productions is now in the possession of the board of trustees for the National Galleries of Scotland in Edinburgh. The engraving of relief figures on glass of two or more strata is an art allied to cameo-cutting, which is dealt with under GLASS. See also INTAGLIO.

Camera Lucida (so named in contrast to *Camera Obscura*, q.v.), an optical instrument constructed of various forms and for various purposes. Dr Robert Hooke invented one about 1674; whilst Dr Wollaston's (1807), intended to facilitate the perspective delineation of objects, consists of a small quadrilateral prism of glass, of which AB in the annexed figure is the perpendicular section, held in a brass frame, which is attached to an upright rod, having at its lower end a screw-clamp,

to fix it to the edge of a table. The prism being at the height of about a foot from the table, has its upper face horizontal. Two of its faces, as in the figure, are at a right angle at A; the contiguous faces make respectively with them angles of $67\frac{1}{2}^\circ$; so that the remaining obtuse angle at B contains 135° . Rays coming from an object PQ, and falling nearly perpendicularly on the first surface, enter the prism, and undergo total reflection at the contiguous surface (see OPTICS); they then fall at the same angle on the next surface, and are totally reflected again; finally, they emerge nearly perpendicularly to the remaining surface. An eye, as in the figure, then receives the emergent pencil through one part of the pupil, so that an image, *pq*, of the object is seen projected upon a sheet of paper upon the table. The rays from the drawing-pencil passing the edge of the prism, enter the other part of the pupil; and the pencil and image being seen together upon the paper, a sketch of the latter can be taken. There is, however, a practical difficulty—the image and the drawing-pencil are at distances sensibly different from the eye, and so cannot be seen together distinctly at the same time. To obviate this, a plate of metal, with a small aperture



Camera Lucida.

as an eye-hole, is placed at the edge under the eye, so that the rays through the prism, and those from the drawing-pencil, which both pass through the eye-hole, form only very small pencils. By this the difficulty is greatly diminished. It is still, however, difficult to use the instrument satisfactorily; and though many acquire great readiness in its use, others have never been able to attain the same facility. A simpler form is merely a piece of smooth glass fixed at an angle of 45° to the horizon. In this case, however, the image seen on the paper below will be inverted. In Amici's form of the instrument a right-angled triangular prism is used, involving two refractions and one reflection.

Camera Obscura (lit. 'a dark chamber'), an instrument described by Giambattista della Porta in his *Magia Naturalis* (1569). It is known in its simplest form as a familiar toy, consisting of a rectangular box, furnished at one end with a lens whose focal length is equal to the length and depth of the box; at the opposite end of which a plane reflector is placed at an angle of 45° , which throws the image of any objects to which the lens may be directed on a piece of ground-glass on the top of the box in a non-inverted position, so that they may be viewed or sketched from as in nature. The instrument received a new interest when in the hands of Daguerre it became the main instrument used in photography. For the photographic camera, see PHOTOGRAPHY.

Camerarius, JOACHIM—originally *Liebhart*, which name he changed into *Camerarius*, because his forefathers had been *Kämmerer* (chamberlains) at the court of the Bishop of Bamberg—was born

at Bamberg, April 12, 1500, and died at Leipzig, after a life devoted to literature, April 17, 1574. His works include an excellent biography of his friend Melanchthon (1566), and a collection of letters by that reformer (1569); also annotations on Cicero's *Questiones Tusculanae* (1525), *Commentarii Linguae Graecae et Latinae* (1551), and *Epistolae Familiares* (3 vols. 1583-95), giving interesting notices of his times.—His son, JOACHIM CAMERARIUS (1534-98), was one of the most learned physicians and botanists of his age.—RUDOLF JAKOB CAMERARIUS (1665-1721) was also a physician and botanist.

Camerino (ancient *Camerinum*), a town of Central Italy, on a spur of the Apennines, 41 miles SW. of Ancona. It has a cathedral occupying the site of a temple to Jupiter, a university (1727), and some manufactures of silk. Its bishopric, dating from the 3d century, was made archiepiscopal in 1787. Pop. 12,000.

Camerlengo (Ital., 'chamberlain'), the cardinal with the control of the papal treasury, who, in the days of the temporal power, administered justice, and during an interim stood at the head of the government.

Cameron, SIR EWAN or EVAN, OF LOCHIEL (1629-1719), fought in Glencairn's rising, 1653 (see GLENCAIRN), submitted to Monk and accompanied him south, and fought under Dundee at Killiecrankie. He submitted to William, but sent his clan to join Mar in the '15.—His grandson DONALD (c. 1695-1748), the 'Gentle Lochiel,' joined the Pretender in the '45, was wounded at Falkirk and Culloden, and fled to France, where he was given the command of a regiment.

Cameron, JOHN (c. 1579-1625), scholar and divine, was born at Glasgow, and educated at the university there. In 1600 he went to the Continent, and held appointments at Bergerac, Sedan, Saumur, and elsewhere. Returning to Britain in 1620, he was two years later appointed principal of the university of Glasgow; but in less than a year he returned to Saumur, and thence to Montauban, where he received a divinity professorship. There, as at Glasgow, his doctrine of passive obedience made him many enemies, by one of whom he was fatally stabbed in the street. Sir Thomas Urquhart and Milton praised his learning. In biblical criticism, where there was a difficulty he usually chose the opposite view to that held by other divines, especially Beza. His eight works, in Latin and French (10 vols. 1616-42), are said to be the foundation of Moses Amyraut's doctrine of universal grace (1634). His followers are sometimes called Cameronites.

Cameron, RICHARD, a Scottish Covenanter, was born in Falkland, in Fife, where he presently became precentor and schoolmaster under an Episcopal incumbent. 'Converted by the field-preachers,' he seems to have become a tutor and then a preacher. In 1678 he went to Holland, and returned in 1680 in time to take a prominent part in publishing the Sanguhar Declaration (q.v.). Retiring then, with some sixty armed comrades, to the hills between Nithsdale and Ayrshire, he succeeded in evading capture for a month, though a price of 5000 merks was set on his head by government. On the 20th July 1680, however, they were surprised by a body of dragoons in Airds Moss, near Auchinleck, and after a brave fight, Cameron was killed. His hands and head were cut off, and fixed upon the Netherbow Port, Edinburgh. See *Life* by Herkless (1896).

Cameron, VERNEY LOVETT, African explorer, was born at Radipole, near Weymouth, 1st July 1844. He entered the navy in 1857, and served in the Mediterranean, the West Indies, and the Red

Sea, and on the east coast of Africa, taking part in the Abyssinian expedition, and in the suppression of the slave-trade. In 1872 he was appointed to the command of an east-coast expedition to relieve Livingstone, and starting from Bagamoyo in March 1873, in August at Unyanyembe he met Livingstone's followers bearing his remains to the coast. After making arrangements for their safe arrival, he proceeded to Ujiji, where he found some of Livingstone's papers and a map, which he forwarded to Zanzibar. He then made a survey of Lake Tanganyika, which he found to be disconnected with the Nile system. In the belief that the Lualaba was the upper waters of the Congo, he resolved to follow its course to the west coast; but owing to the hostile interposition of the native chiefs, was prevented from verifying a conviction, the correctness of which was demonstrated by Stanley in 1877. Taking a more southerly route, he reached the Portuguese settlement of Benguela, on the west coast, 7th November 1875, whence he returned to England. A C.B. and Commander, in 1878 he explored the route for a Constantinople-Bagdad railway to India; and in 1882, with Sir Richard Burton, he visited the Gold Coast. He died, through a hunting accident, at Leighton Buzzard, 26th March 1894. Among his works are *Across Africa* (1877), *Our Future Highway to India* (1880), and several boys' books.

Cameronian Regiment, since 1881 Cameronians (Scottish Rifles), long the 26th infantry Regiment, had its origin in a body of Cameronians (1689). Taking advantage of their zeal and courage, the Convention which sat at Edinburgh induced a number of them to assist in the Revolution, which it was imagined by some was to re-establish the reign of the Covenant. They were induced to enlist on the understanding that the special object of the corps was 'to recover and establish the work of Reformation in Scotland, in opposition to popery, prelacy, and arbitrary power, in all the branches and steps thereof, till the government in church and state be brought to that lustre and integrity which it had in the best of times.' Thus was formed the celebrated Cameronian Regiment, with the youthful Lord Angus as colonel, and for lieutenant-colonel and actual commander, William Cleland, the poet, by whom, ten years before, Drumclog had been mainly won. Under him, not yet in his 30th year, the regiment was sent northwards to quell the insurrection, after the fall of Claverhouse at Killiecrankie. Surrounded by 5000 Highlanders, the Cameronians, only 1200 strong, gallantly defended themselves during a whole day in Dunkeld, 21st August 1689. Cleland fell early in the fight, but his work was accomplished, for, in Macaulay's words, 'the Cameronians had finished the war.' The regiment has ever done credit to its origin, being distinguished alike for gallantry and for good conduct.—The Cameron Highlanders, long known as the 79th Foot, are of course a distinct regiment.

Cameronians, the religious body in Scotland popularly named after Richard Cameron (q.v.), but officially called Reformed Presbyterians. No doubt the principles of the body are those for which Cameron contended and died. In 1681 societies were organised bearing the names of the districts to which they belonged, such as Teviotdale, Nithsdale, Clydesdale, for the purpose of defence against the oppression of the government, and for the maintenance of worship. They published in 1687, as their first testimony, 'The Informatory Vindication,' declaring their adherence to the principles and position of the Church of Scotland during the period between 1638 and 1649. In this document they expressly state, 'we positively disown, as

horrid murder, the killing of any because of a different persuasion or opinion from us, albeit some have cast this odious calumny against us.' Not till after 1688 did the small body of Presbyterians, who insisted upon this restoration of the civil and ecclesiastical polity of 1638 to 1649 in opposition to the Revolution settlement, become a separate church. According to the Solemn League and Covenant, ratified by the parliaments of England and Scotland, and also by the Assembly of Divines at Westminster in 1643, Presbyterianism was to be maintained in the kingdoms of England, Scotland, and Ireland, and popery, prelacy (expressly defined as 'church government by a variety of orders'), superstition, heresy, schism, &c., were to be extirpated, and the royal authority upheld 'in the preservation and defence of the true religion, and the liberties of the kingdom.' In the judgment of these Presbyterians the Covenant was a protest against absolutism, with this peculiarity that it was emitted in a form adapting it to ecclesiastical as well as civil purposes. As a measure of pacification Presbyterianism was established in Scotland by act of parliament (1690); but it was of a modified kind, the state reserving for itself a control over the church incompatible, in the opinion of the Cameronians, with its spiritual independence; while prelacy was confirmed in England and Ireland, and there was a general toleration of heresy. Therefore, in sentiment, if not in form, the extreme party repudiated the government of William III. and his successors, and maintained the perpetually binding obligation of the Covenants. Unquestionably these Cameronians acted under strong convictions, and only desired to carry out to a legitimate issue theoretical principles of the Church of Scotland which, for prudential considerations, have been practically in abeyance; and it is in the standards of this body that we find a true embodiment of the tenets held by the great body of English and Scottish Presbyterians of 1643.

Although thus an elder sister of the existing Church of Scotland and all its secessions, it was with some difficulty that, after the Revolution, it organised a communion with ordained ministers. The steadfastness of members was put to a severe trial by the defection of their ministers; but in 1706, after their faith and patience had been tried for sixteen years, they were joined by the Rev. John M'Millan from the Established Church, and shortly afterwards by the Rev. John M'Neil, a licentiate of the same church. To confirm the faith of members, and give a public testimony of their principles, the covenants were solemnly renewed on Auchensauch Hill, near Douglas, in Lanarkshire, in 1712. The subsequent accession of the Rev. Mr Nairn enabled the Cameronians to constitute a presbytery at Braehead, in the parish of Carnwath, on the 1st August 1743, under the appellation of the Reformed Presbytery. Other preachers afterwards attached themselves to the sect, which continued to flourish obscurely in the west of Scotland and north of Ireland, and in 1774 a presbytery was constituted in North America. The political position of the Cameronians was very peculiar, since, declining to recognise any laws or institutions which they conceived to be inimical to those of the kingdom of Christ, they refused to take the oath of allegiance. For this cause many of them formerly, though peaceable subjects otherwise and zealous for the interests of their native land, refused several of the responsibilities and privileges of citizens. In 1860 there was an attempt on the part of some of the kirk-sessions to prevent the members exercising the franchise, or becoming volunteers, on account of the oath of allegiance which required to be taken. On the question coming before the synod, inquiry was made as to

the meaning of the oath, and in the judgment of the majority it was ascertained that the oath was taken, and the franchise exercised, by Christian men of all other denominations in a sense which did not commit them to an approval of evils in the constitution to which they objected. It was decided accordingly, in 1863, to abstain from the exercise of discipline to the extent of suspension and expulsion on such questions. In consequence of this decision, to which forty-two congregations adhered, ten or twelve congregations seceded. In 1876 the larger body of the Reformed Presbyterians formally united with the Free Church, believing it to be in the full enjoyment of the spiritual independence which the Revolution settlement had failed to secure for the Church of Scotland, and recognising no difference between them in their civil relations. The principles of the Cameronians are now, therefore, distinctively represented by the few congregations which seceded in 1863. See the *Testimony of the Reformed Presbyterian Church* (1842).

Cameroon, or **KAMERUN**, till 1919 a German colony—conquered (1916) by French and British troops—on the west coast of Africa, extending from the Bight of Biafra to Lake Chad, and bounded by Nigeria, French Equatorial Africa, and the Spanish colony of Rio Muni, takes its name from the Cameroon River (Port. *camarão*, 'a shrimp'), whose estuary, opposite Fernando Po, is over 20 miles wide. The low mangrove swamps that clothe its banks render the climate very trying to Europeans. The comparatively civilised natives of the inland region are Sudanese; those of the coast belong to the Bantu (q.v.) group; their 'kings,' Bell and Akway, practically wholesale merchants, raised trouble by their refusal to permit natives of the interior to trade directly with Europeans. England declining to assume the protectorate, Germany was appealed to, and annexed Cameroon in 1884. The coast country is very fertile, ebony, red-wood, and palm-trees clothing the Cameroon, which has long been noted as an 'oil river,' and for its cotton and ivory; while many tropical fruits grow wild. North-west of the estuary lie the Cameroon Mountains, a volcanic group, which attain a height of 13,746 feet in the peak Mongo ma Loba ('mount of the gods'). The highest summit was first attained by Burton and Mann in 1862. Inland is a plateau, where cattle-rearing has become a flourishing industry. After the cessions by France in 1911 from French Congo, the territory touched the Congo at Bonga and the Ubangi at Mongumba. The ceded territory reverted to France (French Equatorial Africa) in 1919. Plantations of cocoa, rubber, kola, coffee, and tobacco have been (rubber and cocoa especially) very successful. Roads, railways, and telegraphs are rapidly being extended. The chief towns are Yaunde (the French capital, pop. 30,000) and Cameroon, or Duala (pop. 22,000); Buea (the German capital), Victoria, Kribi, Rio del Rey, and Campo are other important trading stations. As mandatories of the League of Nations in 1920 Britain took an interrupted strip (25,000 sq. m.) adjoining Nigeria (including Buea and the mountains), and France the rest (166,500 sq. m.).

Camillus, **MARCUS FURIUS**, a celebrated Roman patrician who first makes his appearance as censor (consular tribune, says Livy) in 403 B.C. He finished the war against Veii, taking the town in 396, after a siege of ten years; and in 394 he besieged the Falerii, who, after bravely defending themselves, were led by his magnanimous restoration of their children to yield unconditionally. Condemned nominally on a charge of misappropriating the booty, but really because of

his patrician haughtiness, he banished himself from Rome (391), and lived in retirement at Ardea, until Brennus (q.v.) had captured and destroyed the whole of Rome except the Capitol. Recalled and appointed dictator, he raised an army, and appearing, according to the legend, just at the moment when the garrison were about to purchase the departure of the Gauls, defeated and drove them from the town. It was due to his strenuous resistance that the proposal of the plebeians to remove to Veii was defeated, and the city rebuilt. He afterwards obtained new victories over the Æqui, the Volsci, and the Etrusci; and in 367 B.C., when war broke out with the Gauls, he, though eighty years old, accepted the dictatorship for the fifth time, defeated the barbarians near Alba, and made peace between patricians and plebeians. After all allowances for a considerable admixture of poetic fiction in the accounts that have come down to us, Camillus still stands out as one of the most prominent and worthy names in the history of Rome. He died of the plague, 365 B.C., lamented by the whole Roman people.

Camisards, the insurgent Huguenots of the Cévennes, so called from the *camise* or blouse worn by the peasants. The revocation of the Edict of Nantes by Louis XIV. in 1685 fired their zeal, which the employment of 'Dragonnades' (q.v.) to enforce the doctrines of the monks despatched as missionaries to the heretical district fanned to fanaticism; prophets and seers arose, who roused the people to a religious frenzy in which death was courted and torture was despised. At first their rage was directed against the tax-collectors, several of whom were murdered and their houses razed; but after an armed rising as early as 1689, a wider movement was brought on in 1702 by the cruelty of the Abbé du Chaila, who tracked out the retreats of the persecuted people, surprised them at worship, and hung some and imprisoned others. His murder gave the signal for a general insurrection; the Camisards' ranks swelled to thousands, and their mountain retreats enabled them to hold the royal forces at bay, while Louis' difficulties were increased by the commencement of the War of the Spanish Succession, and by the encouragement afforded to the insurgents by his enemies. Several detachments of soldiers had already been beaten back or cut off when in 1703 Marshal Montrevel was sent into the district at the head of 60,000 men. This man, once a Huguenot, now fiercely persecuted his former co-religionists; large numbers were shot down or executed, and 436 villages were destroyed. The Camisards retaliated with equal ferocity; in the diocese of Nîmes alone 84 priests were strangled, and some 200 churches burned down. The skill of their principal leader, Jean Cavalier (q.v.), his plan to pass into Dauphiné and unite with the Duke of Savoy, and the undoubted spread of the revolt, caused great anxiety; moreover, the burghers of Nîmes, Montpellier, Orange, &c., were in sympathy with the people and supplied them with all necessities, and even cast the bells of the burned churches into cannon for them. In April 1704 Montrevel was superseded by Marshal Villars, who followed a wiser course; he promised a free pardon to all who might surrender, and released all prisoners who were willing to swear allegiance, while he had every person taken in arms shot on the spot, and broke up his army into flying columns, which scoured the country on all sides. One band after another submitted; on the 10th May Cavalier accepted the amnesty; and by the end of 1704 the zealots who persevered in the war had all been taken and shot. The severity of the Duke of Berwick, Villars's successor (1705), occasioned a fresh outbreak; but this was put down in April with entire desolation of the province,

and the destruction or banishment of a great portion of the inhabitants. Many followed Cavalier into the service of the British in Spain, where most of them found a grave at Almansa in 1707.

Camlet, a fabric made from the hair of the Angora goat (q.v.), or even, in Britain, of wool, or of wool mixed with silk, cotton, or linen.

Cammaerts, ÉMILE, born at Brussels 16th March 1878, settled in England in 1908, and wrote, in French, patriotic Belgian poems, besides criticism, history and plays.

Camoens (*Camões*), LUIS DE, the greatest poet of Portugal, was born at Lisbon in 1524. In 1537 Camoens was entered at the lately-reformed university at Coimbra as one of the 'honourable poor students.' As by the reforms of John III. the new methods and studies of the revival of learning had been introduced into that university, Camoens had here the opportunity, not only of studying Latin and Greek in the new spirit, but was brought into contact with the best thought of his time. A few years later this would have been impossible, as the university fell completely under the dominion of the Jesuits. It was the wish of his friends that Camoens should enter the church, but this he resolutely declined to do. While he was still a student he wrote his *Amphitriões*, which was acted before the authorities of the university. He returned to Lisbon probably in 1542. He now fell in love with Donna Caterina Ataíde, who filled such a large place in his thoughts till her death, long afterwards, near the close of his stay in the East. The lady returned his affection, but her father prohibited their union; and the poet had to content himself with passionate protestations in his *Rimas*—short poems after the model of the Italians. For reasons not ascertained Camoens was banished from Lisbon for a year, at the close of which he joined a Portuguese force at Ceuta, and served there for two years, losing his right eye by a chance splinter. In 1550 he again returned to Lisbon, where for the next three years he seems to have led a somewhat discreditable life. On the occasion of a procession on the festival of Corpus Christi, one of Camoens' friends having become involved in a quarrel with one of the king's equerries, Camoens interfered and wounded the equerry. Having been thrown into prison, he was released only on his volunteering to proceed to India. Accordingly, in 1553 Camoens sailed for that country, and reached Goa that year. While here he engaged in two military expeditions, by way it would seem of escaping from Goa, whose society was but little to his mind. His bold denunciations of the Portuguese officials in that town at length led to his banishment to Macao in 1556. This exile was, however, an honourable one, as he held a lucrative post, from which, in two years, he realised a considerable fortune. During his stay in Macao he may have written the first six books of his chief poem, *The Lusíads*. Returning to Goa in 1558, Camoens was shipwrecked and lost everything except his poem. Arrived at Goa, he was shortly afterwards thrown into prison through the machinations of his former enemies; but at length, after an exile of sixteen years, Camoens returned to Portugal as poor as he had left it. The remainder of his life he spent at Lisbon in poverty and obscurity. In 1572 he published *The Lusíads*, with a dedication to King Sebastian. It had an immediate and brilliant success, but did little for the fortunes of its author, who died in a public hospital, 10th June 1580.

Few poets have had a career so chequered and full of adventure as Camoens. From the very outset misfortune attended him, and though to a certain extent his misadventures were due to his

own indiscretions, these indiscretions were the faults of a bold, earnest, and upright nature. In India his ill-fortune was largely due to his outspoken scorn for the unscrupulous conduct of his countrymen. His contempt for the arts of the courtier accounts for his neglect at home. But if he was neglected in his lifetime, his countrymen have made him ample amends since his death. They have indeed insisted on assigning a rank to *The Lusíads* (*Os Lusíados*, 'the Lusitanians') which other nations have not recognised as its due. There is, however, good reason why the Portuguese should value it so highly. In this poem Camoens did for the Portuguese language what Chaucer did for English and Dante for Italian, and made himself, moreover, the interpreter of the deepest feelings and aspirations of the Portuguese nation. It has been called 'The Epos of Commerce,' and the Portuguese regard it as their national epic. The radical faults of the poem are its inartistic construction, and its puerile use of the classical mythology; and as in translation the felicity of the language and the smoothness of the rhythm by which the original is specially distinguished are in large measure lost, these faults have told greatly against its popularity with foreign readers.

Of Camoens' 352 sonnets, 70 have been well translated by Aubertin (1881); and there is a complete version by Sir R. Burton (2 vols. 1885). The following are the chief English renderings of *The Lusíads*—by Sir R. Fanshawe (1655), Mickle (1771-75; 6th ed. 1877), Musgrave (1826), Quillinan (books i.-v. 1853), Sir L. Mitchell (1854), Aubertin (2 vols. 1878), and Sir R. Burton (2 vols. 1881). For the countless editions, see the *Bibliographia Camoniana* of Braga (Lisbon, 1880) and Vasconcellos (Oporto, 1880); also Sir R. Burton's *Camoens: his Life and his Lusíads; a Commentary* (2 vols. 1882).

Camomile, or CHAMOMILE (*Anthemis*), a genus of Compositæ. The species are annual and

perennial herbs, all palæarctic. The most important species of the genus is *A. nobilis*, which has long been known for the medicinal virtues of an infusion of its flowers (*Flores Anthemidis*) as a bitter stomachic and tonic. These properties seem mainly due to an essential oil which is prepared by distillation; a bit-



Camomile (*Anthemis nobilis*).

ter principle is also present, but no alkaloid. The plant is cultivated at Mitcham in Surrey, at Kieritzsch and elsewhere in Saxony, and in Belgium. Its flowers differ from the wild forms in being all more or less double, but those in which the conversion of tubular into ligulate florets has been less complete, leaving a somewhat yellow centre, are called by druggists *single camomiles*. The largest, whitest, and most completely double flowers are most esteemed. The other British species are mere weeds; one of them, called Stink-

ing Camomile (*A. Cotula*), is so acrid as to blister the fingers. But the flowers of the Dyer's Camomile (*A. tinctoria*), common on the Continent, yield a beautiful dye.

Wild Camomile (*Matricaria Chamomilla*) is the common camomile of German writers. It has long been employed as an adulterant or substitute for the other, and (illicitly) in brewing; its flower-heads are, however, easily distinguished, being quite single and not bitter; the receptacle is also hollow and devoid of the bracteoles which largely characterise the true camomile. A cultivated variety of *M. Parthenium* (*Feverfew*, q.v.) has also to be distinguished. The camomile of the Indian bazaars is said to be a variety (*M. Suaveolens*) of the former species.

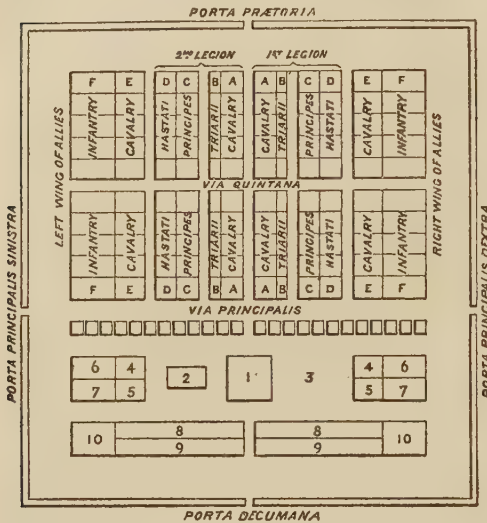
Camorra, the name of a secret society in the former kingdom of Naples, the members of which were called *Camorristi*, and which for many years plundered and terrorised the country, undertaking also the transport of smuggled goods, and contracting for the commission of serious crimes. It had a central rendezvous in every large provincial town, and twelve such in the city of Naples; and for each of these sections there was a chief, with powers of absolute command, and a treasurer with charge of the common fund. Their wide and secret organisation enabled them to extend their system of extortion to all trades and classes; they even imposed a regular tax on all articles of food entering Naples. Candidates for membership swore upon an iron crucifix a fearful oath of fidelity and secrecy; and only after periods of pupillage and probation did they receive the two knives of peculiar form, by which the *Camorristi* recognised one another. Under King Ferdinand II. the Camorra was tolerated for political reasons. The government of Francis II. endeavoured to seize and transport all known members of it. Those who remained entered into alliance with the Garibaldian committee, and rendered essential service in the expulsion of the Bourbons. An attempt to employ them in the police service failed; and the society, by its promotion of brigandage, gave great trouble to the Italian government. At one time they became a political machine manipulated for plunder, and practically dominated the municipality of Naples, which had to be suspended for a time (1899). Investigations begun in 1907 led to a great trial of *Camorristi*, and in 1912 all but a few were convicted (some of murder), and sentences up to twenty or thirty years' penal servitude inflicted. See **MAFIA**, **SECRET SOCIETIES**.

Camouflage (Fr. slang) applies the principles of protective coloration (see **PIGMENTS OF ANIMALS**) to the misleading of the enemy in warfare, by assimilating objects to the appearance of the background and breaking up their outlines; or (as in 'dazzle-painting') throws the observer out of his reckoning by fantastic patterns.

Camp, a collection of tents or huts for the shelter of troops. See also **HILL-FORTS**. A Roman army never halted for a single night without throwing up an entrenchment capable of containing the whole of the troops and their baggage. The Roman camp, as described by Polybius, was intended to accommodate an ordinary consular army, or two legions with *socii*, or allies—in all, 16,800 foot and 1800 horse. Its general form was square, each side 2017 Roman feet in length (the Roman foot being 11·65 English inches), the whole surrounded by a ditch (*fossa*), the earth dug out being thrown inwards, so as to form an embankment (*agger*), on the top of which was a palisade (*vallum*) of the wooden stakes (*valli*, *sudes*) which were carried by each soldier.

The whole camp was divided into two unequal

divisions by a straight road, the principal thoroughfare of the camp, called the *Via Principalis*, 100 feet in breadth, running parallel with the front and rear of the camp. At each extremity of this road was a gate; these were respectively the *Porta Principalis Dextra*, and the *Porta Principalis Sinistra*.



In front of the enemy was the *Porta Praetoria*, and opposite it the *Porta Decumana*. These were the four outlets of the camp.

The upper portion of the camp, separated from the lower by the *Via Principalis*, contained about one-third of the space occupied by the lower portion. In its centre stood the *Principia* (1), or general's tent, in the middle of an open square extending 100 feet on each side of it, its sides each 200 feet long, extending parallel with the sides of the camp. To the left of the *Principia* was the *Quæstorium* (2), the quarters of the *quæstor*; to the right, the *Forum* (3), the public market of the camp. Immediately before the *Principia* ranged the tents of the twelve *Tribuni* and the *Præfecti Sociorum*, or generals who commanded the allies. In the spaces marked 4, 5, 6, and 7 on either side of the *Prætorium*, were the general's staff, including probably the *Legati*, together with the *Prætoria Cohors*, consisting chiefly of picked men selected from the *Extraordinarii*; the former two being cavalry, the latter two infantry. In 8 were the remainder of the *Extraordinarii Equites*, facing towards the *Via Principalis*; in 9 the remainder of the *Extraordinarii Pedites*, facing towards the *agger* or rampart. The spaces marked 10 were reserved for occasional auxiliaries.

The centre of the lower portion of the camp was occupied by the two Roman legions which constituted an ordinary consular army, consisting of the infantry and cavalry of both legionaries and allies. It was divided into two equal parts by the *Via Quintana*, a road, 50 feet wide, which ran parallel to the *Via Principalis*, while the whole of the interior was surrounded by an open space, 200 feet wide, between the rampart and the tents, which allowed the troops ample freedom for movement. The tents were pitched in the twelve oblong compartments sketched in the plan, six above and six below the *Via Quintana*, and separated from each other by roads 50 feet wide. Each of these compartments was 500 feet long, and was divided into ten rectangular spaces, the proportional size of which is exactly represented in the plan. In the

spaces marked A, each containing 10,000 square feet, were the *Equites* of the Legion, each of the ten spaces being occupied by one *turma* of thirty men and horses. In B, each containing 5000 square feet, were the *Triarii* of the Legion, each of the ten spaces being occupied by a *manipulus* of sixty men. In C, each of 10,000 square feet, were the *Principes* of the Legion, each of the ten spaces being occupied by two *manipuli* of sixty men. The spaces marked D, each of 10,000 square feet, contained the *Hastati* of the Legion, each of the ten spaces being occupied by two *manipuli* of sixty men. In E again, each containing 13,300 square feet, were the *Equites Sociorum*, each of the ten spaces occupied by forty men and horses; while in the spaces F, each 20,000 square feet in extent, were the *Pedites Sociorum*, each of the ten spaces accommodating 240 men.

The tents all faced the *Via* which formed their boundaries. Before each gate was posted a strong body of *velites*, called *custodes*, to prevent a surprise of the enemy, while pickets of cavalry and infantry, called *stationes*, were thrown forward in advance in each of the four directions to give timely warning of the approach of an enemy. Finally, sentinels (*excubiae*) kept guard along the ramparts. The night, reckoned from sunset to sunrise, was divided into four equal spaces called *vigilæ*. The watchword (*signum*) for each night was inscribed on small tablets of wood (*tesserae*), which were passed along the whole lines, and returned to the tribunes again.

The different parts of the camp were so distinctly marked out and measured off beforehand, that the men on their arrival at once proceeded to their respective stations, as if they had entered a well-known city, and were marching to their accustomed quarters. After the Roman legions came to be divided into *cohorts* instead of *maniples*, the plan of the camp necessarily became somewhat altered, but its general plan and main features as to interior arrangement remained the same. In comparing the encampments of the Romans with those of his own countrymen, Polybius tells us that the Greeks trusted mainly to a judicious selection of their ground, and regarded the natural advantages which they thus secured as supplying in a great measure the place of artificial means of defence. The Greeks, consequently, had no regular form of camp, and no fixed places were assigned to the different divisions of the army. When the practice of drawing up the army according to cohorts, introduced by Marius and Cæsar, was adopted, the internal arrangements of the camp experienced a corresponding change. Later, even the square form was abandoned, and the camp was made to suit the nature of the ground. It was always held to be of importance, however, that the camp should occupy a defensible position, that it could not be overlooked, and that it had a command of water.

When stationary camps (*castra stativa*) came into more general use, we hear of several parts, which are not mentioned by Polybius, for example, the infirmary (*valetudinarium*), the farriery (*veterinarium*), the forge (*fabrica*), &c.; and as a great variety of troops then came to be employed, they must, of course, have had new stations appointed to them in the camp. Standing camps were divided into *castra æstiva*, a permanent summer camp, and *castra hiberna*, a permanent winter camp. Many of the stationary camps ultimately grew into towns—an origin seen in the names of such English towns as Colchester, Winchester, Manchester, and Chester itself. Amongst the most perfect in Britain of those which retained the form of the simple encampment, is that at Ardoch (q.v.) in Perthshire, in the grass-covered mounds and ridges of which

most of the divisions of the camp have been distinctly traced by antiquaries.

MODERN CAMPS.—The principles of castrametation, or camp-formation, underwent much change after the invention of gunpowder. Camps are now collections of tents or huts in which soldiers are lodged during a campaign or field manoeuvres. The immense size of European armies makes it impossible to carry tents for the troops, and they are almost always accommodated in Cantonments (q.v.) or Bivouacs (q.v.). The Italians alone retain the 'tente d'abri,' which, weighing only 11 lb., can be carried in portions by the three men who sleep in it. But in hot climates, and when, as in most British expeditions, the force engaged is comparatively small, they are placed 'under canvas,' forming what are called *flying camps* if occupied for one or two nights only, and *standing camps* if stationary for a longer period. At Aldershot (q.v.), Shorncliffe, Colchester, and the Curragh of Kildare, large camps of exercise have been established; and small instructional camps are formed for a few weeks every summer in the various military districts, to train the regulars, special reserves, and territorials in the duties of camp life and field operations.

British regulations lay down rules for 'minimum camping space in yards,' from which the following figures are taken, the first number being the frontage—cavalry regiment, 160 by 150; horse or field battery, 75 by 150; brigade ammunition column, 100 by 150; infantry battalion, 75 by 150; field ambulance, 120 by 200; divisional supply column, 150 by 200.

Certain typical arrangements of these unit camps are also laid down, but the ground available will often necessitate modifications. Each bell-tent takes 12 to 15 men. In a battalion camp each row of tents contains the men of a half-company, making eight rows for rank and file. If numerous units are camped together, each is to have a parade-ground of at least 60 yards in depth in front of its camp, 25 yards is left clear at the sides, and to each unit is allotted a route for marching into the open. Ground with steep slopes is avoided, as also woods with undergrowth, low meadows, newly turned soil, sites of old camps. Sanitary squads, superintended by an officer, are constantly at work. Dismounted units are placed nearest to the water-supply.

All units have, to mark their locations, distinguishing flags by day and lamps by night, and finger-posts are erected for all important directions. The commander-in-chief has a Union Jack by day and two red lamps vertically; a division has a red flag, and a red and a green lamp vertically; ammunition column, square blue flag, and red and green lamp horizontally; supply column, triangular blue flag, and green lamp; hospital or field ambulance, jack and Geneva flag side by side, and two white lamps horizontally; latrine, yellow flag; &c.

The site of a camp should have a plentiful supply of good water and wood for fuel, the ground firm turf, with sand or gravel subsoil, good natural drainage, easy communications throughout, and access to good roads in front and rear. Tactical considerations, if within two days' march of the enemy, are paramount, and must decide the position of the camp. Thus, a large force intending to fight a battle, in a chosen position, would be encamped or bivouacked in rear, but near enough to occupy it before the enemy's advanced artillery could come within range, the camp being, if possible, invisible to the enemy. Infantry would be encamped in front and on the flanks of cavalry and artillery, which take longer to turn out, and should therefore have this protection. The safety of such a camp would be ensured by a strong line of outposts some three miles in front of the fighting

position, and probably by an advanced cavalry screen 10 or 20 miles farther towards the enemy. It follows that the system of surrounding camps or bivouacs by defensive works is no longer necessary nor possible when armies of perhaps 250,000 men are in question. But if a small force is holding a point on the lines of communication or operating against savages, some obstacle is essential to check a sudden onslaught of overpowering numbers upon front, flank, and rear.

When, as on the march, time does not admit of regular fortification, some sort of protection must be improvised. This was done in the Sudan campaigns by utilising the baggage and by surrounding the camp with a 'zareba,' or impenetrable inclosure of thorn bushes cut down for that purpose. In Zululand also, the Boer method of forming a 'laager' round the camp by interlocking the baggage-wagons was adopted, after the disaster of Isandhlwana had demonstrated the necessity of some protection against the enveloping attack of the Zulu army.

The cantonments of a besieging army are strengthened against sorties by entrenchments, and *entrenched camps* have now superseded other forms of permanent Fortification (q.v.). Such a camp consists of a girdle of detached forts surrounding the *enceinte* at a distance of several miles, so that the area thus inclosed is a protected position from which a field army can operate.

Campagna, a town of Italy, 13 miles E. of Salerno, with a cathedral, and some trade in wine, oil, fruit, and wood; pop. 10,000.

Campagna di Roma, an undulating plain of Italy surrounding Rome, including the greater part of ancient Latium, with a length of about 90 miles, and an extreme breadth inland, to the Alban and Sabine hills, of 40 miles. A broad strip of sandy plain skirts the Mediterranean, with a thick fringe of pines. The ground is almost entirely volcanic, the lakes being crater-lakes, and the Tiber winds across the plain between banks of tufa, of which the Seven Hills of Rome are composed. For many centuries malaria has been endemic, and the inhabitants very few in number, being driven away in summer by fear of the *aria cattiva* or pestilential vapour to which Malaria (q.v.) was believed to be due. In autumn herdsmen descend from the Apennines with their herds, the pasturage in some parts of the plain being rich and abundant; and skins, wool, and cheese, together with wine, are exported in some quantity. This district was not always desolate. Of late it has been maintained that the seeds of malaria were introduced from Africa in Hannibal's wars. Certainly fever was not endemic till long after that. Domitian and Hadrian built here their splendid villas; and in the early years of the Republic such towns as Veii and Fidenæ stood here, as well as a number of small places that survived till medieval times. It was swept by Goths, Vandals, and Langobards from the 5th to the 8th century, afterwards by Normans and Saracens, and stripped of its remaining wealth by rival barons; the removal of the pope to Avignon completed its desolation, which neglect, the cessation of tillage, and successive inundations of the Tiber, always more frequent as the inland forests were destroyed, only intensified, and which later efforts in the way of drainage, canalisation, and timber-planting did little to remove. Pius VI. especially endeavoured to drain the Pontine Marshes, and, during their dominion in Italy, the French effected some improvements. Garibaldi also during his later years interested himself greatly in the matter, and since the discovery of the real cause of malaria a good deal has been done to render part of the Campagna habit-

able, especially the real Roman Campagna for a radius of 25 miles round Rome, and a few desert areas have been occupied. But still only a very small part of the larger area is under cultivation. Elsewhere only mean taverns and the huts of shepherds and vine-dressers break the solitudes that stretch for miles round Rome. See Lanciani's *Wanderings in the Roman Campagna* (1909).

Campan, JEANNE LOUISE HENRIETTE, born in Paris, October 6, 1752, from 1770 till 1792 was Marie Antoinette's confidant, and during the Reign of Terror withdrew to the valley of Chevreuse, beyond Versailles. After the fall of Robespierre she opened a boarding-school at St Germain-en-Laye; and in 1806 she was appointed by Napoleon head of the Institution at Ecouen for the education of the daughters of the officers of the Legion of Honour. At the Restoration this institution was suppressed, and Madame Campan retired to Mantes, where she died, May 16, 1822. She is remembered on account of her *Mémoires sur la Vie Privée de la Reine Marie Antoinette* (1823), *Journal Anecdote* (1824), and *Correspondance Inédite avec la Reine Hortense* (1835). See works by Flammarion (1886), Carette (1891), and Montagne (1914).

Campanella, TOMMASO (properly *Giovann Domenico*), was born 5th September 1568, at Stilo in Calabria, and studied at Naples and Cosenza. He entered the Dominican order in his fifteenth year. The writings of Telesius first awakened his doubts respecting the 'scholastic philosophy.' The results of his first studies were given in his *Philosophia Sensibus Demonstrata*, &c. (Naples, 1591), which contained a defence of Telesius. His superiority in disputations exposed him to the hatred and false accusations of the orthodox monks and schoolmen. He was in consequence compelled to flee from Naples to Rome, and thence to Florence, Venice, Padua, and Bologna. He returned to Calabria in 1599, but being suspected of having involved himself in a political conspiracy, he was seized and confined in a Neapolitan dungeon for twenty-seven years; tried five times, and tortured seven; accused of heresy; and declared the author of a book which had been published thirty years before he was born. In 1626 Pope Urban VIII. had him brought to the prison of the Inquisition at Rome, and three years afterwards gave him his liberty and a yearly pension. After being again persecuted by the Spanish government, Campanella went to Paris, where he was graciously received by Louis XIII. and Richelieu. He died in the Dominican monastery of St Honoré, near Paris, 21st May 1639. More than 40 works on various subjects (several of which are lost) were written by Campanella during his imprisonment. His philosophical views were characteristic of the transition from the 16th to the 17th century. In his theory of perception, which starts from the external sense ('sensum solum sapere'), he is a forerunner of the empiric and sensualist school; in his doctrine of the inner sense (which is the condition of the outer) he finds his refuge from scepticism; and his conviction that we possess in our consciousness of self an impregnable certainty of our own existence points forward to Descartes and Leibnitz. His aim was to reconcile the theology of Aquinas with the natural philosophy of Telesius by means of his metaphysics; and to prove that all worldly powers should serve the Church, and all secular science be the handmaid of religion. His *De Monarchia Hispanica Discursus* is a work of great power and value, comprising a sketch of the political world of Campanella's time, with special reference to Spain. It was translated into English during Cromwell's Protectorate. Of his other works the most noteworthy are *Astrologorum, Libri VII.* (1617); *De Sensu Rerum et Magia*

(1620); *Philosophia Epilogistica Realis* (1623); *Universalis Philosophia, Partes III.* (1638); *Philosophia Rationalis et Realis, Partes V.* (1638); and *Civitas Solis* (1623), an imitation of Plato's *Republic*. His Life has been written by Baldacchini (1847), Berti (1878), and Amabile (3 vols. 1882). His poems and sonnets, first published by his German disciple, Tobias Adami, in 1622, had been lost sight of, until, after a long search, they were rediscovered by J. G. Orelli. They were republished by him in 1834, and by Gentile in 1915. The *Sonnets* were translated into English verse by J. Addington Symonds in 1878.

Campanero. See BELL-BIRD.

Campanha, a town in the Brazilian state of Minas Geraës, 150 miles NW. of Rio de Janeiro, surrounded by bare hills, much cut up by gold-mines, but with large herds of cattle on the lowlands; pop. 8000.

Campania, anciently a province on the west coast of Italy, having Capua as its capital (now subdivided into the provinces of Benevento, Naples, Salerno, Avellino, and Caserta), lying between Latium, Samnium, and Lucania. It was one of the most productive plains in the world, yielding in extraordinary abundance corn, wine, and oil; and by both Greek and Roman writers is celebrated for its soft and genial climate, its landscapes, and its harbours. It was the *regio felix* of the Romans, who built here many of their most splendid villas, and made Baiæ, with its hot springs, the centre of their fashionable world. The promontory Misenum, Mount Vesuvius, the river Volturnus, the towns Baiæ, Cumæ, Liternum, Puteoli, Naples, Herculaneum, Pompeii, Nola, Salernum, Capua, &c., belonged to Campania. In very early times the Greeks founded Cumæ, from which Puteoli, Naples, and other places were colonised. The district was next conquered by the Etruscans, by whom Capua, Nola, and other towns, were founded, but who succumbed to the more warlike and hardy Samnites, who, in their turn, yielded to the irresistible valour of Rome. Through all these vicissitudes of conquest the substratum of the people remained as at the beginning. The mass of the Campanians were essentially of Oscan (q.v.) race, and Oscan they remained. Indeed it is mainly from them that our knowledge of the Oscan language is derived, and one of their towns, Atella, introduced to the early Roman stage a species of popular drama or comedy. See ATELLANÆ.

Campanile (Ital. from low. Lat. *campana*, 'a bell'), a name adopted from the Italian to signify a bell-tower of the larger kind, and usually applied only to such as are detached from the church. Scarcely any of the existing bell-towers of England answer to the Italian conception of the campanile; and the beautiful 'campanile' at Salisbury, demolished by Wyatt in 1790, was really a multangular Belfry (q.v.) surmounted by a leaden spire. In Italy campaniles are found everywhere—at Rome, Bologna, Padua, Ravenna, Cremona, Venice. Perhaps the most remarkable are the so-called 'leaning tower' of Pisa and the campanile of Florence. The former, which is circular in form, is decorated with columns and arcades to the summit of its eight stories (see ROMANESQUE ARCHITECTURE). But though less curious, the famous campanile of Giotto at Florence is perhaps even more worthy of the traveller's attention. It was erected in 1334-37, with the express object of surpassing, both in height and in richness of workmanship, any of the remains of antiquity. In form it is a parallelepiped, and is of the same dimensions from bottom to top. Though it is very lofty—275 feet—it consists of only four stories, of which the

tallest are the uppermost and undermost. The style is Italian Gothic, and the walls are entirely veneered with marble. The original design of Giotto was that a spire of 90 feet in height should have surmounted the present structure, and on the summit may be seen the four great piers from which it was intended that it should have risen. The splendid campanile of Florence, in its present condition, must thus be regarded only as a fragment. There is a fine campanile at Seville, 275 feet in height, the lower part of which (185 feet) was built as a minaret by Abu Yusuf Yakub in 1196, whilst the upper was added in 1568. It is called La Giralda ('the weather-cock'), from a bronze figure of Faith, which, though it weighs a ton and a quarter, turns with the wind. The campanile attached to the palace of the Scaligeri at Verona is very graceful, and characteristic of the Italian principles of



Campanile, Palace of the Scaligeri, Verona.

tower-building. The origin of the campanile as an adjunct to Christian structures is unknown. It cannot originally have been used for bells, as in early times only hand-bells of very small size were in use. Most probably, like the round towers of Ireland, the campaniles were constructed as places of security and observation. The earliest examples, such as those at Ravenna, are lofty and round. In later times the campanile was found useful for the great bells of the churches and cities, when they became objects of importance, and received elaborate decoration. They continued to be erected in all the styles of architecture practised in Italy up to recent times. Numerous Renaissance examples are thus found in Venice and elsewhere, that of St Mark's (rebuilt 1903-11) being a conspicuous feature of the city.

Campanology. See BELL.

Campan'ula (Lat., 'a little bell'), a genus of Campanulaceæ (q.v.), commonly known as Bell-flowers or Bells. The species number about 200, chiefly palæarctic, but found as alpine plants in warmer and southern regions. The flowers are generally beautiful, and many are cultivated. The common wild *C. rotundifolia* is, however, more familiar than any other species, both on account of its commonness and simple beauty, and as the

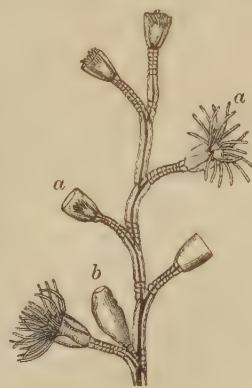
Harebell (q.v.) of English poetry and Bluebell of Scottish song. *C. Trachelium*, the nettle-leaved campanula, and *C. glomerata* are not uncommon, both wild and in cultivation; but the biennial species, so familiar in gardens as Canterbury Bells, is *C. medium*, a native of Central Europe, which has yielded many florists' varieties, presenting great diversity of colour, size, and doubleness. As annuals and perennials for the herbaceous border and rock-garden many other species and varieties are esteemed; while *C. rapunculus* (Rampion or Ramps) was formerly more cultivated than at present on account of its esculent root, the leaves being also used in salads.



Canterbury Bell.

Campanulaceæ, an order related to Compositæ; herbs, rarely shrubs or trees, with bitter milky juice; acrid and often poisonous; diuretic. The young shoots and roots of some species are, however, occasionally eaten, as is also the half-fleshy fruit of *Canarina campanula*, in the Canaries. While the Campanuloideæ, with regular bell-like corolla and free anthers, are chiefly palæarctic, the Lobelioideæ, with irregular corolla and coherent anthers, are chiefly tropical or subtropical. *Phyteuma* and *Jasione* have heads like the Compositæ. See CAMPANULA, LOBELIA.

Campanularia, a common genus of Hydrozoa (q.v.), and type of a family, Campanulariæ. The delicate stem bearing the colony of polyps may be simple or branched; the nutritive individuals are surrounded by transparent bell-shaped sheaths, within which they may be retracted. The mouthless, tentacle-less, reproductive individuals bud off sexual ones, which do not, however, go free as they so often do in allied genera. The group of generative buds produced by the reproductive person is inclosed within a special sac-shaped sheath, and the whole thing is called a sporosac. In allied genera, though not in Campanularia, the sexual buds go off as swimming-bells, and from their generative products and embryos the fixed asexual plant-like 'zoophyte' is again formed. The genus is common in north European seas and in the Mediterranean. Allied genera are Clytia, Hincksia, Laomedea (with sporosacs), Eucope, and Obelia (with free swimming-bells). See HYDROZOA and books there named;



Campanularia:

a, nutritive individuals; b, reproductive individuals or sporosac.

Johnston's *British Zoophytes*; Allman's Ray Society Monograph on Hydromedusæ.

Campbell, an ancient and illustrious Scottish family, to which genealogists have chosen to assign an Anglo-Norman origin, deriving its surname from the Latin *De Campo Bello*. According, however, to the 8th Duke of Argyll, it is purely Celtic, of Scotch-Irish origin; and *Cambel*, as the name was always formerly written, is just the Celtic *cam beul*, 'curved mouth.' Sir Duncan Campbell of Lochow, created Lord Campbell in 1445, and his descendants, the ducal house of Argyll (q.v.), have been noticed already. From his younger son, Sir Colin Campbell of Glenorchy (circa 1400-78), are descended the earls and marquises of Breadalbane (creations 1681 and 1831-85); and from the younger son of the second Earl of Argyll, who fell at Flodden in 1513, the earls of Cawdor (created 1827).

Campbell, ALEXANDER, founder of the sect known as the 'Disciples of Christ,' or more commonly the 'Campbellites,' was born near Ballymena, in County Antrim, in 1788, but emigrated to the United States in 1807. He early adopted the opinions of his father in protesting against all human creeds, and asserting that the sole authority in religious things was the Bible alone. Though at first a Presbyterian, in 1812 he formed a connection with the Baptists, and for some time he laboured as an itinerant preacher principally in Western Pennsylvania, Virginia, and Ohio. In 1826 he published a translation of the New Testament, in which the words 'baptism' and 'baptist' gave place to *immersion* and *immerser*. Some loosely defined expressions in his writings have been interpreted as implying a belief in baptismal regeneration, a doctrine which the Disciples repudiate. By his discussions on public platforms, and his serial publications, the *Christian and Baptist* and the *Millennial Harbinger*, as well as by his assiduity in preaching tours and in training young men for the ministry, Campbell gradually formed a large party of followers, who began about 1827 to form themselves into a sect under the designation of 'The Disciples of Christ,' which has now, in the United States, about 7000 churches and a million and a quarter members. In 1841 Campbell founded Bethany College in West Virginia, and there he died, 4th March 1866. His writings were numerous. See his *Life* by Richardson (1868).

Campbell, SIR COLIN, LORD CLYDE, one of the bravest soldiers and most distinguished generals of modern times, was born in Glasgow, 20th October 1792. His father was a carpenter, named MacIver, but Colin assumed the name of Campbell from his mother's brother, Colonel John Campbell, who in 1802 put him to school at Gosport. He was gazetted an ensign in 1808, and by 1813 had fought his way up to a captaincy, serving on the Walcheren expedition (1809), when he contracted a life-long ague, and through all the Peninsular war, where he was severely wounded at the siege of San Sebastian and the passage of the Bidassoa. He took part in the expedition to the United States (1814), and then passed nearly thirty years in garrison duty at Gibraltar, Barbadoes, Demerara, and various places in England, in 1837 becoming lieutenant-colonel of the 98th foot. For the brief Chinese campaign of 1842 he was made a C.B., and for his brilliant services in the second Sikh war (1848-49) a K.C.B., thereafter commanding for three years at Peshawur against the frontier tribes. On the outbreak of the Crimean war in 1854 he was appointed to the command of the Highland Brigade; the victory of the Alma was mainly his; and his, too, the splendid repulse of the Russians by the 'thin red line' in the battle of Balaklava. He was rewarded with a K.G.C.B.,

with a sword of honour from his native city, and with several foreign orders, and in 1856 was appointed Inspector-general of Infantry. When on 11th July 1857 the news reached England of the sepoy Mutiny, Lord Palmerston offered him the command of the forces in India, he started next day for Calcutta. He reached it in August; on 17th November, with 4700 men, effected the final relief of Lucknow; and on 20th December 1858, having five months earlier been created Lord Clyde, announced to the viceroy that the rebellion was ended. Returning next year to England, he was made a field-marshal, and received a pension of £2000. He died 14th August 1863, and was buried in Westminster Abbey. See his *Life* by Lieutenant-general Shadwell (2 vols. 1881).

Campbell, GEORGE, divine, was born in 1719 at Aberdeen, and educated there at the grammar-school and Marischal College. Abandoning law for divinity, he was in 1748 ordained minister of Banchory Ternan, a parish 17 miles SW. of Aberdeen; in 1757 was called to that city, and in 1759 was appointed Principal of Marischal College. His first book was his famous *Dissertation on Miracles* (1762), in answer to Hume, a work which in its own day was greatly admired, and characterised as 'one of the most acute and convincing treatises that has ever appeared on the subject.' It was speedily translated into French, Dutch, and German. In 1771 Campbell was elected professor of Divinity in Marischal College. In 1776 he published his *Philosophy of Rhetoric*, in 1789 a *Translation of the Gospels*. He died 6th April 1796; and in 1800 appeared his *Lectures on Ecclesiastical History*, with a memoir by G. S. Keith prefixed.

Campbell, JOHN, BARON, Lord Chancellor of England, biographer of the chancellors, was born 15th September 1779 at Cupar-Fife, the third child of the parish minister. He was destined for the ministry, and passed in 1790 from Cupar grammar-school to St Andrews University, which he left in the spring of 1798 to become tutor to the son of a West India merchant in London. Having determined to follow the legal profession, Campbell joined Lincoln's Inn (1800), read for several years in the chambers of the famous Mr Tidd, during which period he also acted as reporter and dramatic critic to the *Morning Chronicle*, and was called to the bar in 1806. His abilities and perseverance, his readiness to assist professional brethren, and the publication of the first volume of his elaborate *nisi prius* 'Reports' (1808), brought him into favourable notice even on the home circuit; and by the end of 1824 he became leader of the Oxford circuit, which he had joined in 1810. In 1821 he married the eldest daughter of Mr Scarlett, afterwards Lord Abinger, who was made Baroness Stratheden in her own right in 1836, and by whom he had three sons and four daughters. He became king's counsel in 1827, and chairman of the Real Property Commission in 1828. He entered parliament in 1830 as member for Stafford, and after some hesitation accepted the Reform Bill of 1831. His real interest lay in law reform. In 1832 he was made Solicitor-general, knighted, and returned to parliament for Dudley. Upon his promotion to the Attorney-generalship in 1834, Campbell, defeated at Dudley, was returned for Edinburgh. In 1841 he became Lord Campbell, and was raised to the Lord-chancellorship of Ireland, an office which he soon resigned, on the defeat of the Melbourne ministry, honourably declining the pension to which he was legally entitled. Lord Campbell was made Chancellor of the Duchy of Lancaster in 1846, Chief-justice of the Queen's Bench in 1850, and Lord Chancellor of England in 1859. He died on the night of 22d June 1861.

In politics Campbell was a consistent Whig. He boasted that the vote, which at some personal inconvenience he had returned from circuit to the House of Commons to give, had carried the second reading of the Reform Bill in 1831. As an advocate, Campbell was sound and industrious rather than brilliant; he was a courteous and eminently painstaking judge. As Chief-justice of the Queen's Bench he presided over the trial of Dr Newman for libel (1855), and the prosecution of William Palmer for poisoning (1856). As Lord Chancellor he delivered judgment in the *cause célèbre* of the Emperor of Austria *v.* Kossuth. Among the statutes introduced by Campbell's influence may be mentioned one limiting liability in actions of defamation (6 and 7 Vict. chap. 96); a second, which he borrowed *without acknowledgment* from Lord Lyttelton, enabling the representatives of persons killed by accident to recover compensation in certain cases (9 and 10 Vict. chap. 93); and a third, against obscene publications (20 and 21 Vict. chap. 87).

It is in his capacity of legal biographer that Campbell's reputation has suffered most severely. His *Lives of the Chief-justices (1849-57)* and of the Lord Chancellors (1845-47), though readable and amusing, are disfigured by childish vanity, by the constant obtrusion of himself and his own achievements, and—at least in the later volumes—by wanton misrepresentation and inaccuracy. Repeating Arbutnot's witty saying on Curll's biographies, Sir Charles Wetherell declared that 'his noble and biographical friend had added a new terror to death.' See the Life by his daughter, the Hon. Mrs Hardcastle (1881); Foss's *Judges*, ix. 155-167; Sugden's *Misrepresentations in Campbell's Lives*; Atlay's *Victorian Chancellors* (1907-8).

Campbell, JOHN FRANCIS, of Islay, a great folklorist, was born December 29, 1822. Educated at Eton and the university of Edinburgh, he held offices at court, and was afterwards secretary to the lighthouse and coal commissions. He travelled much, and died at Cannes, 17th February 1885. An enthusiastic Highlander and profound Gaelic scholar, as well as a man of singularly lovable nature, Iain Og Ile ('Young John of Islay') preserved all the affectionate loyalty of the islanders of Islay, although he had lost the estates of his fathers. An obelisk was raised to his memory in the June of 1887 on the summit of Cnoc-na-Dàb, a hill in Islay, near his birthplace. Campbell's great work is his *Popular Tales of the West Highlands* (4 vols. Edin. 1860-62), one of the most important contributions ever made by any scholar to the scientific study of folk-tales, or *storiology*, to use his own word. Only those who have themselves made experiment in collecting folk-tales can appreciate the marvellous combination of devoted patience and quick intelligence, with profound sympathy and insight into primitive habits of thought, that went to the making of such a book. Had he lived longer he might have given folklorists further volumes out of the ample store of materials he left behind him. His *Leabhair na Feinne*, a series of Gaelic texts, he began to issue in 1872. Campbell gave much attention also to scientific studies, fruits of which were his *Frost and Fire, Natural Engines, Toolmarks and Chips* (1865), *Thermography* (1883), and the invention of the sunshine-recorder for indicating the varying intensity of the sun's rays. His *Circular Notes* (1876) consisted of letters written home during a tour round the world.

Campbell, JOHN M'LEOD (1800-72), a Scottish theologian, born at Kilninver in Argyllshire, went to Glasgow University at eleven, was ordained minister of Row in 1825. His views on the per-

sonal assurance of salvation and the universality of the atonement led to his deposition for heresy by the General Assembly in 1831. Campbell refused to form a new sect or to attach himself to that of his devoted friend Edward Irving. For two years he laboured in the Highlands as an evangelist, and for six-and-twenty years, from 1833, preached quietly without remuneration in Glasgow. His principal works were *Christ the Bread of Life* (1851), *The Nature of the Atonement* (1856), and *Thoughts on Revelation* (1862).

See ATONEMENT; the *Memorials* by his son (2 vols. 1877), and Maughan's *Annals of Garelochside* (1896).

Campbell, LEWIS, Greek scholar, born in Edinburgh in 1830, was educated at Edinburgh Academy and the universities of Glasgow and Oxford (Trinity and Balliol), and became a Fellow of Queen's College. He took orders in the Church of England, and was a parish clergyman in Hampshire until 1863. In that year he was appointed to the professorship of Greek in the university of St Andrews. Twenty-nine years later he resigned his chair, and on the 25th October 1908 he died at Brissago, Lago Maggiore. He did much to further the study of Greek, giving special attention to Sophocles and Plato. Besides his great work, the edition of *Sophocles: The Plays and Fragments* (2 vols. 1871-81), he published editions of Plato's *Theætetus* (1861), *Sophistes* and *Politicus* (1867), and, with Jowett, *The Republic*. He translated Sophocles and Æschylus into English verse, and discussed *The Tragic Drama in Æschylus, Sophocles, and Shakespeare*. He was also the author of a book on *Religion in Greek Literature*. Apart from his Greek studies, he prepared with Mr William Garnett *The Life of James Clerk Maxwell* (1882), and with Mr Evelyn Abbott *The Life and Letters of Benjamin Jowett* (1887); and he edited Jowett's essays and theological writings.

Campbell, MRS PATRICK (Beatrice Stella Tanner), actress, born in 1865 at Kensington of mixed English and Italian parentage, married in 1884, went on the stage in 1891, and gained fame in the *Second Mrs Tanqueray* (1893). Her first husband died in South Africa in 1900; in 1914 she married George Cornwallis-West. See *My Own Life* (1922).

Campbell, THOMAS, poet, was born in Glasgow, 27th July 1777, the youngest of the eleven children of an unfortunate merchant. From the grammar-school of his native city he passed in 1791 to the university, where he remained off and on till 1796, winning several prizes, and being specially distinguished for his knowledge of Greek literature. In 1795 he went as a tutor to the island of Mull. The scenery of the West Highlands made a deep impression on his mind, and to his abode in those grand and desolate regions his verses owed much of their finest touches of sublimity. In 1797 he repaired to Edinburgh, intending to study law; but he could not shake off his recollections. In his eyes the mists were folded on the hills of Morven, the roar of Corrievekin was in his ears, and instead of poring over musty law-books, he wrote *The Pleasures of Hope*. It was published in 1799, and ran through four editions in a twelvemonth. During a ten-months' tour on the Continent (1800-1) Campbell visited the battlefield of Hohenlinden, at Hamburg fell in with the prototype of his *Exile of Erin*, and sailed past the batteries of Copenhagen. In 1803 he married and settled in London, having refused the offer of a chair at Wilna, and resolved to adopt a literary career. He contributed articles to *The Edinburgh Encyclopædia*, and compiled *The Annals of Great Britain from George II. to the Peace of Amiens*. In 1806, through Fox's influence, he received a pension of £200 per annum from government. In

1809 appeared *Gertrude of Wyoming*, which bears the same relation to *The Pleasures of Hope* that *The Castle of Indolence* bears to *The Seasons*—a less brilliant and striking, but more mature and finished performance. In 1818 Campbell was again in Germany, and on his return he published his *Specimens of the British Poets*. In 1820 he delivered a course of lectures on poetry at the Surrey Institution; and from this date to 1830 he edited *The New Monthly Magazine*, contributing thereto several poems, one of which, *The Last Man*, is in some respects the loftiest of all his performances. In 1827-29 he was elected and re-elected Lord Rector of the university of Glasgow. He died at Boulogne, 15th June 1844, and was buried in Westminster Abbey, a Polish noble sprinkling his coffin with dust from Kosciusko's grave. Campbell is an English classic, though his fame has somewhat declined. His larger poems are now little read, and command but a qualified admiration. His fame must rest, not on their conventional merits, but on the fire of his war songs; *Hohenlinden*, *Ye Mariners of England*, and *The Battle of the Baltic* can hardly be matched in the language.

See the *Life and Letters*, edited by Beattie (1859); the short *Life* by Cuthbert Hadden (1900); and the *Poems* as edited by Prof. Lewis Campbell (a descendant, 1904) and Logie Robertson (1908).

Campbell-Bannerman, SIR HENRY (1836-1908), who as premier secured the restoration of self-government to the Transvaal and the Orange Free State, was second son of Sir James Campbell of Stracathro, the head of a business house, who was Lord Provost of Glasgow in 1840-43. He assumed the name Bannerman in 1872. Educated at Glasgow and Trinity College, Cambridge, he became Liberal M.P. for the Stirling burghs in 1868, and was Chief Secretary for Ireland (1884-85) and War Secretary (1886 and 1892-95). In 1895 he was created a G.C.B., in 1899 became Liberal leader in the House of Commons, and in December 1905 prime-minister.

Campbell Island, a lonely volcanic islet, far to the south of New Zealand, in 52° S. lat., 167° E. long., is included in the Dominion.

Campbeltown, a royal burgh and seaport of Argyllshire, on the E. coast of Kintyre, 83 miles SW. of Glasgow. It curves round the head of a small sea-loch sheltered by Davaar Island (300 feet high), which forms a magnificent harbour. A sculptured granite cross (12th c.) stands in the main street. The place, which is a fishing centre, and has over twenty whisky distilleries, till 1918 united with the Ayr burghs to return one member to parliament. Pop. 7000.

Campe, JOACHIM HEINRICH, a German educationist, born near Holzminden in 1746, was tutor for a time to the brothers Humboldt, and minister in Potsdam. After serving with Basedow (q.v.) at the *Philanthropin* in Dessau, he founded an institution of his own, and in 1787 undertook the reorganisation of the school-system in Brunswick, where he also established a large publishing house. He died 22d October 1818. His theoretical works on education were of importance in their time, and his *German Dictionary* (5 vols. 1807-11), though weak in its historical department, is still of value. His books for the young (37 vols. 4th ed. 1832) have been remarkably popular, especially *Robinson der Jüngere* (Eng. trans. 1855). See his *Life* by Leyser (2 vols. Bruns. 1877).

Campeachy (*San Francisco de Campeche*), a seaport on the west side of the peninsula of Yucatan, on a bay of the same name. It has a citadel, colleges, and other fine buildings, and shipbuilding docks. The haven is safe, but very shallow, and the trade, principally in logwood and

wax, has greatly fallen off; while cigars and palm-leaf hats are almost the only manufactures. Founded in the middle of the 16th century, it was taken, occupied, and burned by buccaneers in 1685. Pop. 20,000. Campeachy gives name to a state of Mexico, having an area of 18,000 sq. m. Pop. 100,000.

Campeachy Wood. See LOGWOOD.

Campeggio, LORENZO, CARDINAL, was born in 1472, of a noble Bolognese family. He studied law, and married early, taking holy orders after his wife's death. He was made Bishop of Feltri, and sent by Leo X. on a mission to the Emperor Maximilian, being created a cardinal in his absence (1517). Next year he visited England as papal legate to incite Henry VIII. against the Turks, and was well received. In 1524 he obtained the bishopric of Salisbury and the archbishopric of Bologna, and he presided the same year at the Ratisbon diet; in 1528 he was despatched to England to hear the famous divorce suit of Henry VIII. against Catharine of Aragon. Perplexed betwixt his own private instructions, pity and regard for the unhappy queen, the dubious counsels of Wolsey, and the imperious impatience of the king, and racked the while by the pains of a severe gout, the cardinal ended by displeasing all parties; and his final revoking of the cause to Rome led ultimately to the king's rupture with the papal court. Campeggio died at Rome in 1539.

Camper, PETER, anatomist, born at Leyden 11th May 1722, studied there, and became professor of Medicine in 1750 at Franeker, in 1755 at Amsterdam, and in 1765 at Groningen. In 1773 he resigned his post, and, on being elected a member of the state council in 1787, removed to the Hague, where he died, 7th April 1789. Camper was distinguished not only for the services he rendered to anatomy, surgery, obstetrics, and medical jurisprudence, but also as a promoter of the fine arts. He was remarkably skilful in pen-and-ink drawing, painted in oil, embossed, and even acquired considerable experience as a sculptor. For his observations on the facial angle, see article SKULL. His work on the connection of anatomy with the art of drawing was an important contribution to the theory of art. His collected writings, with plates, appeared at Paris (3 vols. 1803).

Camperdown (*Dutch Camperduin*), a broad tract of low dunes in North Holland, about 25 miles N. of Haarlem, separating the small hamlet of Camp from the German Ocean, is famous for the victory obtained off the coast here by Admiral Duncan (q.v.) over the Dutch fleet under Admiral van Winter, October 11, 1797. Duncan was created Viscount Duncan of Camperdown, his son (in 1831), Earl of Camperdown.

Camp Followers are the sutlers and dealers in smallwares who follow an army. In India, owing to the peculiar habits and customs of the natives, and the large number of servants retained by European troops, the camp followers sometimes number four times the actual force: comprising servants, grooms, grass-cutters, mule and camel drivers, water-carriers, sutlers, snake-charmers, dancers, conjurers, and women. Even in European armies they are necessary; they are at all times under the control of the commanding officer, but only subject to military law when in the field.

Camphausen, OTTO VON, Prussian statesman, was born, 21st October 1812, at Hünshoven, Rheinland, studied at Bonn, Heidelberg, Munich, and Berlin, and in 1845 became a counsellor of the ministry of finance. He was elected as a moderate Liberal to the Prussian diet in 1849, and in 1869 became finance minister. He succeeded in restoring prosperity, but conflict with Bismarck on

economic policy led to his resignation. He died 18th May 1896.

Camphausen, WILHELM (1818-85), German painter, was born at Düsseldorf, and from 1859 was professor in the art academy there. He was specially famous for battle-pieces—scenes from Cromwell's battles, the Thirty Years' War, the wars of 1866 and 1870—and painted many notable portraits of soldiers and equestrian figures.

Camphenes. See CAMPHORS.

Camphine, a name formerly applied to a variety of turpentine obtained from the *Pinus australis* of the southern states of America. It used to be used as an illuminant in Britain.

Camphors, or CAMPHENES (through the Arabic *kafur* from the Hindi or Malay *kapur*), are organic compounds of the *terpene* series of hydrocarbons, and are found with essential oils in many plants. They are extracted with the oils by steam. Common camphor of commerce is obtained chiefly from the Camphor Laurel (*Cinnamomum* (*Laurus*) *Camphora*), a tree of China, Japan, Formosa, and Cochin-China, which has been grown in Java and various parts of Malaya, in Ceylon, Jamaica, some parts of the United States, and in Italy. Practically the supply comes mainly from Japan and Formosa. By the ordinary old-fashioned method, the wood is cut into chips and distilled with water, the vapour of camphor rising with the steam being collected in the head of the still. In the refining process the grains of impure camphor are detached, and being introduced, along with a small proportion of quicklime, into a large globular glass vessel in quantities of about 10 lb., are reheated, when first the water rises in steam, and is allowed to escape at a small aperture; and thereafter, this aperture being closed, the camphor sublimes and resolidifies in the interior upper part of the flask as a semi-transparent cake, leaving all the impurities behind. The flasks are then cooled and broken by throwing cold water on them, and the camphor taken out and sent into market. The glass globes employed are called by an Italian name, *bombolo*, the sublimation of camphor having been first practised in Venice. Camphor is also sent into the market sublimed in almost powdery crystals, as 'flowers of camphor,' a very convenient form for pharmaceutical purposes.—Camphor was unknown to the Greeks and Romans, but has been highly valued since ancient times in the East, and was first brought to Europe by the Arabs. It is a white tough solid, slightly lighter than water, and having the formula $C_{10}H_{16}O$. It is very sparingly soluble in water, but freely soluble in alcohol, ether, acetic acid, and the essential oils. It fuses at $175^{\circ}C.$, and boils at $204^{\circ}C.$, but volatilises somewhat rapidly at ordinary temperatures. When set fire to, it burns with a white smoky flame. Thrown upon water, it floats, and may be set fire to, when the currents generated alike from the gradual solution of the camphor in the water and the irregular burning of the pieces cause a curious rotatory motion. It has a peculiar hot aromatic taste, and an agreeable characteristic odour.

Camphor is used alike in European and Oriental medicine, both internally and externally, as a temporary stimulant. It is frequently employed in gout and rheumatism. In small doses it acts as an anodyne and antispasmodic; in very large doses it is an irritant poison. It is generally reckoned an anaphrodisiac, although some maintain that it has an opposite action. Its alcoholic solution, and liniments in which it is the principal ingredient, are much used for external application in sprains and bruises, chilblains, chronic rheumatism, and paralysis. It is of use, combined with chloroform, for allaying pain in neuralgia and toothache. The

odour of camphor is very noxious to insects, and it is therefore much used for preserving natural history specimens; but its antiseptic value against influenza or cold is not to be relied on.

Since camphor has come to be widely used in making celluloid, it has been recognised that felling the tree is a wasteful process; distillation of young shoots is to be preferred. Analysis shows that the leaves of the camphor tree, even the fallen leaves, contain more camphor than the wood.

Borneo or Sumatra Camphor is the produce of *Dryobalanops aromatica*, a large tree of the order Dipterocarpaceæ, and is similar to the Laurel Camphor of commerce, but has a more acid flavour. Its composition is $C_{10}H_{16}O$, and it can be converted into common camphor by the action of nitric acid. The same tree also yields a 'camphor oil' isomeric with oil of turpentine, $C_{10}H_{16}$. A third kind, of secondary value, is prepared at Canton from *Blumea balsamifera*, a tall herbaceous composite. Camphor is now used on a large scale in making celluloid and smokeless powder, in perfuming soap, and as a solvent in varnishing.

Artificial Camphor is made from oil of turpentine or its isomers. It resembles ordinary camphor in its physical properties.

Menthol, or peppermint camphor ($C_{10}H_{19}OH$), occurs in the volatile oils of *Mentha piperita*. It is used to allay pain in neuralgia and toothache, and as a disinfectant.

Thymol ($C_{10}H_{15}OH$) is obtained from wild Thyme, and is a member of the camphor series.

Camphuysen, DIRK RAFELSZ (1586-1627), Dutch poet, painter, and theologian, was born at Gorkum. He was deprived of his living, near Utrecht, for Arminianism. Some of the pictures attributed to him are by others believed to be the work of his nephew Raphael (1598-1657) and his great-nephew Govaert Camphuysen (1624-74).

Campi, a family of artists of some note, at Cremona, in the middle and near the close of the 16th century. GIULIO CAMPI, the oldest brother (1500-72), studied painting, sculpture, and architecture under Giulio Romano, and has left a fine altar-piece at Cremona, full of the Venetian beauty of colouring.—ANTONIO CAMPI was a successful imitator of Correggio, and had some merit as an architect and engraver. He wrote a chronicle of his native place, and died after 1591.—VINCENZO CAMPI (died 1591) excelled in small figures; some of his portraits and paintings of fruits also are highly valued.—BERNARDINO CAMPI (1522-90) was the son of a goldsmith, and possibly a kinsman of the three brothers Campi. He studied first under Giulio, but soon excelled his master. Although he imitated the works of Titian with such success that it has been difficult to distinguish the copies from the originals, he is not purely Venetian in his style, but borrowed much from both Correggio and Raphael. Many of his works are found in Mantua and Cremona, and are highly valued.

Campinas (SÃO CARLOS DE), a town of Brazil, on a fertile plain, 44 miles N.W. of São Paulo. There are large coffee and sugar plantations in the surrounding district. Pop. 30,000.

Campine, a coal-mining district in the provinces of Antwerp and Limburg in Belgium (q.v.).

Campion is the common name of plants of the genera *Lychnis* (*Melandryum*) and *Silene* (q.v.).

Campion, EDMUND, the first English Jesuit martyr, nicknamed 'the pope's champion,' was born in 1540, the son of a London tradesman, and was educated at the new Bluecoat school and St John's College, Oxford. He became the most popular man at the university, but hankered after the old religion, which he had abandoned by taking

the new oath of supremacy, and by receiving deacon's orders in the Church of England. In 1569 he betook himself to Ireland to help in re-establishing Dublin University. But becoming suspected of leanings towards Rome, he escaped to Douai, and soon joined the Society of Jesus in Bohemia. In 1580 he was recalled from Prague, where he was professor of Rhetoric, to accompany Parsons on the Jesuit mission into England. His career in England was brief but eventful. For twelve months he eluded the pursuivants, while no man in the country was more talked of. The audacity of his controversial manifesto known as *Campion's 'Brag and challenge,'* which was followed by his *Decem Rationes*, printed at a secret press in Stonor Park, greatly irritated his opponents. In July 1581 he was caught at Lyford, and sent up to London, tied on horseback, with a paper stuck on his hat inscribed 'Campion, the Seditious Jesuit.' He was tried on a charge of conspiracy of which he was undoubtedly innocent; for, unlike his brethren Parsons, Holt, and others, he never meddled with political plots. The conferences held by him in the Tower and the proceedings of his trial made a considerable sensation. He was executed with two secular priests on December 1, 1581, and beatified by Leo XIII. in 1886. See *Life* by Simpson (new ed. 1896).

Campion, or **CAMPIAN**, THOMAS, lyric poet and lutenist composer, prosodist and contrapuntist, was born, 12th February 1567, at Witham in Essex, son of an Irishman. He studied at Cambridge, Gray's Inn, and abroad, practised medicine, and died, 1st March 1620, in London. He published Latin *Poemata*, four *Books of Ayres* or songs with accompaniments, *Observations in the Art of English Poesie*, *Songs of Mourning* for Prince Henry, several masques, and a book on counterpoint. Though he railed at rhyme, he was a consummate master of rhymed verse. He wrote words not only for his own songs, but for those of his friend Philip Rosseter. See editions by Bullen (1889, 1903), Vivian (1909), and E. H. Fellowes (*Songs from Rosseter's Book of Airs*, 1922, *et seq.*); also Macdonagh, *Campion and the Art of English Poetry* (1913).

Camp-meetings, gatherings of devout persons, held usually in thinly-populated districts, and continued for several days at a time, are especially associated with Methodism in America. Their introduction into England (1799) led to the separation of the Primitive Methodists from the Wesleysans. See **BOURNE** (HUGH).

Campobasso, a town of South Italy, among the Apennines, 52 miles N. of Benevento by rail. It has several fine churches and important manufactures of cutlery. Pop. 14,400.—The province (formerly *Molise*) is very mountainous, and little of the land is cultivable. The chief industry is sheep-raising. Area, 1700 sq. m.; pop. about 349,000.

Campobello, two towns of Sicily. (1) **CAMPOBELLO DI LICATA**, 17 miles N. of Licata by rail, with sulphur mines; pop. 8000.—(2) **CAMPOBELLO DI MAZZARO**, 32 miles SSE. of Trapani by rail, with famous quarries, which were worked by the Romans; pop. 10,000.

Campo-Formio, a village of Northern Italy, 6 miles SW. of Udine, is celebrated for the treaty of peace here concluded on 17th October 1797 between Austria and the French Republic, whose army, under Bonaparte, after subjugating Italy (1796), had crossed the Noric Alps, and threatened Vienna. Austria ceded the Netherlands, Milan, and Mantua, and received as compensation Istria, Dalmatia, and the left bank of the Adige, with

the capital, Venice; while France took the remaining territory of Venice, its possessions in Albania, and the Ionian Islands.

Campomanes, PEDRO RODRIGUEZ, COUNT OF, Spanish statesman and writer, born in Asturias in 1723, held many posts under Charles III., and in 1789-91 was president of the council of state. He died February 3, 1802. Besides an account of the antiquities of Carthage, he published (1774) the first good Spanish treatise on political economy, and a work on the education of artisans (1775).

Campos, SÃO SALVADOR DOS, a town in the Brazilian state of Rio de Janeiro, on the Paralyba, which is navigable for small craft to this point, 30 miles from its mouth. It has some imposing buildings, fine wharves, sugar factories, and a trade in coffee, sugar, brandy, and timber. Pop. 70,000.

Câmpulung, or **KIMPOLUNG**, a town of Walachia in a valley at the foot of the Carpathians, 80 miles NW. of Bucharest; pop. 15,000.—There is another Kimpolung in the extreme south of Bukovina; pop. 10,000.

Campvere, now called **VERE**, **VEERE**, or **TER-VERE**, and formerly often written **CAMPHIRE**, a small fortified town on the north-east of the island of Walcheren, in the Netherlands province of Zeeland, with a port on the Veergat, which separates Walcheren from North Beveland. The town has fallen into decay; but its former prosperity is indicated by such large edifices as the town-house and cathedral church. In 1304 Campvere was the scene of a battle between William, Governor of Holland, and Guy, Count of Flanders; in 1572 the Spaniards were driven away; and in 1809 the town was bombarded and occupied during the disastrous Walcheren expedition. For three and a half centuries it was the seat of a Scottish factory. Scottish trade with the Low Countries was of some importance as early as the end of the 13th century, and spite of English opposition grew in the next. At first Bruges was the headquarters of trade; when Bruges lost its commercial pre-eminence (after 1488) Campvere, Middelburg, and Antwerp competed for the monopoly of Scottish trade till 1541, when Campvere became the staple port. Here the Scottish merchants obtained various privileges and immunities; they had a conciergerie house or hotel; their Conservator exercised supreme authority over them; and from 1613 a regular Scots Kirk, minister, and manse were maintained here. In 1795, under the Batavian republic, the staple privileges were withdrawn and the factory broken up, but the conservatorship was held as a sinecure till the middle of the 19th century. The church, which ranked as part of the presbytery of Edinburgh, was broken up in 1799; a congregation at Middelburg was in some sense regarded as its successor, but in 1894 the general assembly of the Church of Scotland declined to receive a representative from Middelburg, while it left the Campvere church still on the roll of the assembly. See *The Scottish Staple at Veere* by Davidson and Gray (1909) and *The Scottish Staple in the Netherlands* by Rooseboom (1910).

Camuccini, VINCENZO (1775-1844), painter, born at Rome, became the head of a school founded on the theatrical antique style of David.

Camus, ARMAND GASTON, French revolutionist, was born at Paris in 1740. A zealous and ascetic Jansenist, and a master of ecclesiastical law, he was elected Advocate-general of the French clergy, and in 1789 member of the States-general by the people of Paris. He now appeared as the resolute foe of the ancient régime, gained possession of and published the so-called *Red Book*, with its details of expenditure so disadvantageous to the court and its



ministers. After the flight of Louis XVI., Camus, with Montmorin, Lafayette, and Bailly, accused the king of treason and conspiracy, and insisted on the suppression of all orders and corporations based on hereditary rights. As conservator of the national archives, he rendered an important service by preserving from destruction the old documents of the abolished corporations and institutions. He was absent in Belgium during the king's trial, but sent his vote for death. Early in 1793, while on his mission to make a prisoner of Dumouriez, Camus himself and his four colleagues were seized and delivered over to the Austrians; but, after an imprisonment of two and a half years, he was exchanged for the daughter of Louis XVI. On his return to Paris he was made member, and afterwards president, of the Council of Five Hundred, but resigned in May 1797, and devoted his time to literature. True to his principles, he voted against Napoleon's proposed life-consulship. He died of apoplexy, November 2, 1804.

Camwood, a dyewood obtained from *Baphia nitida*, a tree of the order Leguminosæ, a native of Angola. It is at first white, but turns red on exposure to air. It produces a finer and richer red than Brazil-wood (q.v.), and is very permanent. *Barwood*, very similar in its properties, but yielding a duller colour, is said to be produced by the same tree.

Canā, OF GALILEE, the scene of the 'beginning of miracles' described in St John's Gospel, chap. ii., and the birthplace of Nathanael, was situated in the neighbourhood of Capernaum, to the W. of the Sea of Galilee. Two modern villages claim to represent the sacred site, and good authorities are divided as to the identification. The one village, now called Kefr Kenna, is $4\frac{1}{2}$ miles NW. of Nazareth; the other, Kana el Jelil, is 9 miles N. of Nazareth. The spring of Ain Kana, still nearer Nazareth, has also been suggested as a probable site.

Canā. See DAHOMEY.

Canaan ('low-land') was the name originally applied to the low coast-land of Palestine on the Mediterranean, inhabited by the Canaanites (strictly so called), as opposed to the mountain-land (cf. Numbers, xiii. 29); and in this original sense the name is still applied in Isa. xxiii. 11, to the Phœnician, and in Zeph. ii. 5, to the Philistine coast-land. Just as with the name Palestine (= Philistia) at a later period, the name Canaan became extended to the whole country, yet only to the part west of the Jordan, the part east of Jordan being contrasted with it as the 'Land of Gilead.' The people and their progenitor (Gen. ix. 18 *et seq.*) were named after their dwelling-place, the Hebrew use of the verb *kanā* (*nikhna* = 'to be bowed, sunken, subdued') readily lending itself to a reference to the conquest of the Canaanites. See PALESTINE.

Canaanites, in the Old Testament, a name very frequently used to include all the heathen inhabitants of the country between the Jordan and the Mediterranean. In the time of the Patriarchs they appear a people in some degree civilised, cultivating their lands and living in towns; and by the time of Joshua their country was thickly peopled, and studded with walled towns, each under its own king. Their religion was a licentious worship of Baal and Ashtoreth, as the productive powers of nature. Their subjugation by Joshua was merely temporary, and it was only by degrees that they were made tributary. The northern tribes of Israel were largely intermixed with the Canaanite element, as is shown many centuries later by the name Galilee ('circle of the heathen'). The tenacity of the Canaanite race is seen from the

fact that the fortress of the Jebusites (Jerusalem) was not conquered till the time of David, and that the remainder of the Canaanites were first reduced to vassalage by Solomon. According to Sayce, 'M. Clermont-Ganneau has shown that the present peasantry of Canaan are the descendants of the ancient Canaanites, partly of Semitic, and partly of non-Semitic blood.' In many passages of the Old Testament the name *Canaanites* has its more restricted sense, signifying one of the peoples of Palestine which dwelt on the low ground on the sea-coast to the north of Carmel—i.e. the Phœnicians. Hence it is that the word 'Canaanite' sometimes is synonymous with 'merchant.' See PALESTINE, PHœNICIANS, HITTITES.

Canada, the great Dominion which occupies the northern part of North America and adjacent islands, exclusive of Alaska, Greenland, the Labrador coast, and Newfoundland. The name is believed to be derived from an Indian word, *kannatha*, meaning a village or collection of huts. Jacques Cartier, hearing the term used by the Indians in connection with their settlements, applied it to the whole of the country. Canada originally comprised the extensive range of territory as far west as the Mississippi, including the great lakes, which was ceded to Great Britain by France in 1763. At the termination of the War of Independence it was limited to the region now occupied by the older parts of the provinces of Ontario and Quebec, described prior to 1867 as Upper and Lower Canada respectively. The Dominion of Canada is a confederation of the colonies of British North America, constituted in 1867 by the British North America Act. Upper and Lower Canada, Nova Scotia, and New Brunswick were the first to unite under the provisions of that statute. The Hudson Bay territory was acquired from the company of that name; a portion of it was formed into the province of Manitoba, the remainder being called the North-west Territories; and both were admitted into the confederation in 1870. In 1871 British Columbia and in 1873 Prince Edward Island became parties to the union. Part of the North-west Territories was subsequently divided into provisional districts as follows: in 1876 Keewatin; in 1882 Assiniboia, Saskatchewan, Alberta, and Athabaska; and in 1905 the North-west Territories were formed 'from the territories formerly known as Rupert's Land and the North-western Territory, except such portions thereof as form the provinces of Manitoba, Saskatchewan, and Alberta, the district of Keewatin, and the Yukon Territory, together with all British territories and possessions in North America, and all islands adjacent to any such territories or possessions except the colony of Newfoundland and its dependencies.' A subsequent act in the same year annexed Keewatin to the North-west Territories. In 1905 the two new provinces of Saskatchewan and Alberta were formed out of the provisional districts of Assiniboia, Saskatchewan, Alberta, and Athabaska by act of the Dominion parliament. In 1912 Quebec, Ontario, and Manitoba were extended to Hudson Bay, Quebec absorbing Ungava, and Ontario and Manitoba dividing Keewatin between them up to the 60th parallel. The North-west Territories were divided in 1920 (by Order in Council of 1918) into the districts of Mackenzie, Keewatin, and Franklin. The disputed Labrador boundary was referred to the Privy Council in 1920.

Canada is bounded on the N. by the Arctic Ocean, on the W. by the Pacific and Alaska, on the E. by Newfoundland (Labrador) and the Atlantic Ocean, and on the S. by the United States. From the Atlantic to the Pacific Ocean is approximately 3000 miles, and from north to

south of the Dominion approximately 1500 miles. The area of Canada is 3,729,665 sq. m., of which 3,603,336 sq. m. are land and 126,329 sq. m. are water. Canada is nearly as large as the whole of Europe. Both the Atlantic and Pacific shores abound in deep indentations, forming magnificent harbours and sheltered bays. On the Atlantic the Bay of Fundy is remarkable for its high and rushing tide, the water rising from 12 to 50 feet. Hudson Bay, connected with the Atlantic by Hudson Strait, is really an inland sea with an area of 450,000 sq. m. The Gulf of St Lawrence is 80,000 sq. m. in extent. The most striking physical features of Canada are the Rocky Mountains, the Laurentian Range, and the chain of immense fresh-water lakes. Hills of no great height skirt the coasts of Nova Scotia and Cape Breton, and the southern bank of the St Lawrence is fringed by the Notre Dame Mountains (also called the Shickshock Mountains), a spur of the Appalachians, the highest parts of which (4000 feet) are in Gaspé. The Laurentian Range extends along the north side of the St Lawrence, along the Ottawa River, and then stretches away to Lake Superior and the north, the length of the range being 3500 miles. It forms the watershed between Hudson Bay and the St Lawrence, and varies in height from 1000 to 3000 feet. The eastern portions of Canada are generally well timbered, as are also British Columbia, and Alberta and Saskatchewan north of the Saskatchewan. Westward of the Red River, between the 49th and 55th parallels, there is an immense fertile plain, which produces the finest wheat in the world. This plain extends nearly to the Rocky Mountains. These mountains consist of three chains with valleys between; the most easterly has the greatest elevation near the 52d parallel, where several peaks exceed 12,000 feet. The average height of the chain is from 7000 to 8000 feet. In the north, adjoining Alaska, is Mount Logan (19,539), and, on the dividing line, St Elias (18,000). Canada is well watered, the map presenting a network of lakes and rivers. The system of the St Lawrence alone, with the great lakes Superior, Huron, Erie, and Ontario (between the last are the celebrated Falls of Niagara), drains an area in Canada of 330,000 sq. m. The area of the great lakes is over 74,000 sq. m.—Lake Superior is 602 feet above the sea-level, and Lake Ontario 246 feet—and with their outlet they form the greatest fresh-water way in the world. The areas of the most important lakes are: Superior, 31,800 sq. m.; Huron, 23,200 sq. m.; Erie, 10,000; Ontario, 7260, all partly in the United States. Other important lakes are Winnipeg (9457 sq. m.), Winnipegosis (2086), Manitoba (1817), Reindeer (2437), Great Slave (10,719), Great Bear (11,821), and Athabaska (2482); and in Baffin Land, Nattilling and Amadjuak.

Next to the St Lawrence, the chief rivers are the Saskatchewan and the Winnipeg, flowing into Lake Winnipeg, and the Nelson, flowing from it into Hudson Bay; the Assiniboine and the Red River, which join their waters at Winnipeg and flow into Lake Winnipeg; the Albany and the Churchill, flowing into Hudson Bay; the Athabaska and the Peace Rivers, flowing into Lake Athabaska, and the Slave River, from it into Great Slave Lake; the Mackenzie, fed from both the Great Slave and the Great Bear Lake, and flowing into the Arctic Ocean; the Fraser and Thompson, in British Columbia, flowing into the Pacific; and in the eastern provinces, the Ottawa, chief tributary of the St Lawrence, itself fed by the Gatineau and Mattawa; the Saguenay, flowing from Lake St John into the St Lawrence; and the St John, which flows into the Bay of Fundy, after a course of 500 miles in New Brunswick, which it partly

separates from the state of Maine. The principal islands of the Dominion are: on the east, Cape Breton, Prince Edward and Magdalen Islands, and Anticosti, in the Gulf of St Lawrence; on the west, Vancouver Island and Queen Charlotte Islands. Lying along the north, in the great Arctic Archipelago, are immense islands, all of which, excepting Greenland, belong to Canada (Imperial Order in Council, 1st September 1880). See AMERICA.

Canada is of such vast extent and so varied in its geographical features that it is not surprising that its climate is most varied and interesting. In Vancouver Island and the lower levels of British Columbia near the sea the climate is very similar to that of Great Britain, with the decided advantage that the summers are drier and there is more sunshine than in the old land. To the eastward of the coast range of mountains the winters are rather cold and the summers hot, with a much smaller annual rainfall than near the coast. In the Okanagan valley peaches and grapes, and even figs and almonds, ripen in the open air. In Alberta the average winter is fairly cold, but the spring sets in early and the summer is quite warm, with hot days and cool nights, and a rainfall usually ample for the crops. In Saskatchewan and Manitoba the winter is colder than in Alberta. It sets in gradually about November, and from December to early March it is pretty cold. In some years there are very low dips in the temperature, but the air is dry and the atmosphere is perfectly clear and bracing. As a rule seeding begins about the end of April, and in some years earlier. The northern districts of Ontario, rich in forests and minerals, have a colder climate than the southern districts, where the peach and grape ripen as readily as in southern France, under skies almost as sunny and in latitudes the same as in northern Spain. In southern Ontario signs of spring begin to multiply early in April or indeed in March, and between the middle of May and the middle of September the whole district is included between the same isotherms as the greater portion of France; and it is only after a protracted autumn that winter sets in about the beginning of December. The winters are by no means severe; and while the summer months proper are distinctly warmer than in England, it is in but few districts that the mean temperature exceeds 70°—hence the heat is not excessive. The annual precipitation of the whole of Ontario lies between 30 and 40 inches, which is fairly evenly distributed throughout the year; in summer, however, the rain generally falls during thunderstorms, and cloudy or wet days are of rare occurrence. The summers in western Quebec are as warm as in western Ontario; in July the 70° isotherm passes not far south of Montreal, the 65° line passes through Quebec city, and most of the Gaspé Peninsula has a mean temperature somewhat below 60°. The winters are cold, but dry and bracing, and may very fairly be compared with those of Petrograd and Moscow. Zero temperatures, while not infrequent, are not the rule, and it is only on a few occasions in each winter that exceedingly cold dips are experienced. The third week in April sees the trees along the St Lawrence budding, and it is not until November that the last red sere leaves fall. The opening of spring in the Maritime Provinces is usually a little later than in southern and western Ontario and the North-west, and somewhat earlier than in the lower St Lawrence Valley; on the other hand, the summer lingers longer, especially in the Annapolis Valley. The summers are, as a rule, not quite so warm as in western Canada, great heat being seldom experienced except very occasionally in the inland stations of New Bruns-

wick. The average precipitation of these provinces is between 40 and 45 inches, except along the southern coast-line of Nova Scotia, where it is nearly 10 inches greater. The whole of Canada, except the region near the coast in British Columbia, is favoured with more sunshine than any portion of Great Britain, Germany, Holland, or northern France. Nearly all parts of the Dominion have an annual percentage of over 40, and a summer percentage of between 53 and 59.

The land areas of the different provinces of Canada are stated as follows: Ontario, 365,880 sq. m.; Quebec, 690,865; Nova Scotia, 21,068; New Brunswick, 27,911; Prince Edward Island, 2184; Manitoba, 231,926; British Columbia, 353,416; Alberta, 252,925; Saskatchewan, 242,808; North-west Territories, 1,207,926; Yukon, 206,427.

Population.—In 1825 the population of Upper and Lower Canada was estimated at 637,211; in 1851, 1,842,265; in 1861, 2,507,657. These figures exclude what are now known as the Maritime Provinces, the estimated population of which in 1861 was: New Brunswick, 252,047; Nova Scotia, 330,857; and Prince Edward Island, 80,857. In 1871, after confederation, the population of Canada (including seven provinces and the territories) was 3,689,257; in 1881, 4,324,810; in 1891, 4,833,239; in 1901, 5,371,315.

The population of Canada at the censuses of 1911 and 1921 was as follows:

	1911.	1921.
Alberta.....	374,295	588,454
British Columbia.....	392,480	524,582
Manitoba.....	461,394	610,118
New Brunswick.....	351,889	387,876
Nova Scotia.....	492,338	528,837
Ontario.....	2,527,292	2,938,662
Prince Edward Island.....	93,728	88,615
Quebec.....	2,005,776	2,361,199
Saskatchewan.....	492,432	757,510
Yukon.....	8,512	4,157
North-west Territories.....	6,507	7,988
Royal Canadian Navy.....	—	485
Totals.....	7,206,643	8,788,483

The rural population was in 1911 3,925,679 and the urban 3,280,964, an increase in the rural since 1901 of 17.20 per cent., and in the urban of 62.28 per cent. In 1921 the numbers were 4,436,041 and 4,352,442, and the increases 12.75 and 32.59 per cent. In 1907-11 something like 2000 new towns sprang up in Canada. Yet only four cities, Montreal, Toronto, Winnipeg, and Vancouver, had over 100,000 inhabitants. To these in 1921 were added Hamilton and Ottawa.

The 20th century has seen an extraordinary increase of immigration, shown by the following figures:

Total Influx.	British Islands.	United States.	Other Countries.
1897.....	11,883	2,412	7,921
1904.....	65,359	43,652	37,255
1905.....	86,796	57,919	44,349
1906 (9 months).....	55,791	34,659	34,217
1907.....	262,469	58,812	53,975
1908.....	146,908	52,901	59,832
1909.....	203,794	59,790	103,798
1910.....	311,084	123,013	121,451
1911.....	354,237	138,121	133,710
1912.....	402,432	150,542	139,009
1913.....	384,878	142,622	107,530
1918.....	79,074	3,178	71,314
1919.....	57,702	9,914	40,715
1920.....	117,336	59,603	49,656

In 1913 the British immigrants were—English, 102,112; Scots, 29,128; Welsh, 1787; Irish, 9585. The following were the other nationalities:

United States.....	107,651	Chinese.....	5,512
Italian.....	24,722	Finnish.....	3,188
Russian.....	24,485	Rumanian and Buko- vinian.....	3,053
Ruthenian and Galician.....	20,064	French.....	2,683
Hebrew.....	11,252	Belgian.....	2,651
Polish.....	9,793	Swedish.....	2,431
German and Austrian.....	8,672		

In 1901-11 negroes and Indians decreased in numbers. There were 27,774 Chinese in Canada in 1911. English is generally spoken in the Dominion, but in some parts of the province of Quebec French is the only language understood. In the Dominion parliament and in the legislature of Quebec members may address the House in either language. The French spoken by some of the *habitants*, as the French-Canadian farmers of Quebec are called, is a patois which resembles the French of the 17th century more closely than the French of modern Paris. The songs of the French-Canadians, especially boat-songs, are many and interesting.

Indians.—In 1917 there were about 106,000 Indians and 3300 Eskimos in Canada. In localities where the Indians can be educated and civilised they have made much progress. They are self-supporting, and engage principally in agricultural pursuits and stock-raising, although many are still hunters and fishermen. The policy of the Indian Department, carried out through its agents, farming instructors, and schools, is designed to make the Indian independent of free assistance. About \$2,000,000 is expended annually on Indians. A system of residential and day schools is established, in which instruction is given in the branches of an ordinary English education, in farming, domestic employments, sewing, and manual training, and a considerable degree of success attends its operations.

Religion.—There is no state church in Canada, and the utmost religious liberty prevails. The Roman Catholics are most numerous, comprising at the census of 1911 more than a third of the whole population—namely, 2,833,041. Two-thirds of these were in Quebec. Next in numbers were the Presbyterians, with 1,115,324; then the Methodists, with 1,079,892; Anglicans, 1,043,017; Baptists, 382,666; Lutherans, 229,864; Orthodox, 88,507; Jews, 74,564; Mennonites, 44,611; Congregationalists, 34,054.

Education.—In 1846 compulsory taxation for the support of free and unsectarian schools was for the first time embodied in the law of Canada. The details differ somewhat in the various provinces, but, generally speaking, the system, which is more or less compulsory, is as follows: Every township is divided into sections sufficiently large for a school. Trustees are elected to manage the affairs, and the expenses are defrayed by local rates and provincial government grants. There are separate schools for Roman Catholics in Ontario, Alberta, Saskatchewan, and Quebec. Teachers are trained at normal schools at the public expense. For those who can afford it—and the cost is very small—there are schools of a higher grade, managed also by trustees. At these, as well as at many excellent private establishments, a classical education is given, and pupils are prepared for the professions. There are also colleges and universities open to youths prepared in the lower schools. Toronto, Kingston, Montreal, and other places have schools of medicine, and the leading religious denominations have institutions at which young men are prepared for the ministry. For the higher education of girls there are also schools. In no country in the world is good education more generally diffused than in Canada, and the highest prizes the country offers are open to all, rich and poor alike. The principal universities are, in the order in which they were founded, as follows: Dalhousie (Halifax, N.S.), 1820; McGill (Montreal), 1821; New Brunswick (Fredericton), 1828; Toronto, 1828; Queen's (Kingston), 1841; Laval (Montreal), 1852; Manitoba (Winnipeg), 1877; Saskatchewan (Saskatoon), 1912. The government also established (1874) the Royal Military College at Kingston. The following are the chief scientific societies: Royal Society of Canada; Natural History Society

of Montreal; Canadian Institute, Toronto; Nova Scotia Institute; Natural History Society, New Brunswick; and Scientific and Historical Society, Winnipeg.

Social Conditions.—The distinctions of caste do not exist to the same extent as in the mother-country, although there is a careful preservation of those traditions which give the general features to English society. Almost every farmer and agriculturist is the owner of his acres—he is his own master, and is free to do as he wills. This sense and state of independence permeates the whole social system, and produces a condition of freedom unknown in older countries. Canada is or has been ahead of the mother-country in many social questions. Thus, as regards the liquor traffic, prohibition prevails; by an act of the Dominion parliament in 1882 marriage with a deceased wife's sister was legalised; religious liberty prevails; there is practically free and unsectarian education; there is a free and liberal franchise; members of parliament are paid for their services; the parliament is quinquennial; and there is no system for legalising pauperism, although orphans and the helpless and aged of both sexes are not neglected.

Public Lands.—The public lands in the various provinces are under the control of the local governments, excepting in the case of Manitoba, Saskatchewan, Alberta, and the North-west Territories, also two tracts of land in British Columbia, one twenty miles on each side of the Canadian Pacific Railway, and the other east of the Rocky Mountains in the Peace River district, where the lands are retained by the Dominion government. Every encouragement is held out to immigration, free or almost free grants of land being obtainable in some of the provinces; while improved farms, with buildings, implements, and machinery, can be purchased from the holders on favourable terms in many parts.

Trade and Commerce.—The value of the imports into Canada for the year 1880 was \$86,489,747, \$71,782,349 being entered for consumption. The imports from the United Kingdom were 48 per cent. of the whole; from the United States, 40·8. In the year 1900 the total value imported was \$189,622,513, of which \$180,804,316 was for consumption; in 1910, \$391,852,692, of which \$375,833,016 was for consumption; in 1920, \$1,150,654,658. About a ninth of the 1920 imports came from Great Britain and Ireland, and two-thirds from the United States. The principal articles are: iron and steel, coal and coke, cotton goods, woollen goods, sugar, chemicals, petroleum and its products, wood and manufactures of wood, bread-stuffs, fruits, hides and skins, flax, hemp and jute and manufactures of, furs and fur goods, gutta-percha, oils, silk and silk goods, tea and tobacco. The total value of the exports in 1910 was \$1,259,208,294—over \$500,000,000 to the United States, and nearly as much to Great Britain and Ireland. The principal exports are wheat and wheat-flour, wood and wooden manufactures, cheese, silver, cattle, fish (salmon, cod, &c.), bacon and hams, copper, gold, apples, furs, hides and skins, agricultural implements, nickel, and paper. The large business which naturally takes place between the provinces it is impossible to estimate.

Defence.—There are now no imperial troops in Canada, the Canadian government having assumed the defence of the fortress of Halifax and the coaling station at Esquimalt in 1905. Besides the fortifications at Halifax and Esquimalt there are defences at St John, N.B., and near Quebec. The force available for land defence is the active militia, numbering about 100,000. Of this number, about 7000 of all arms form the permanent force, or regulars, available for service at all times, and

constituting the instructional force of the militia. They are distributed at various points throughout Canada, from Halifax to Esquimalt. Military service was made compulsory in 1917. In 1899–1901 Canada sent several strong contingents to South Africa to assist the mother-country in the Boer war. During the Great European War some 600,000 were enlisted, of whom 400,000 were sent overseas.

The North American squadrons of the imperial navy were withdrawn from the Atlantic and Pacific stations in 1905. In 1910 the Canadian government passed the Naval Service Act, providing for the creation of the Canadian 'Naval Service,' the construction of dockyards, &c., and the recruiting of men for this purpose in Canada. Arrangements were made for building the ships in Canada; but pending the establishment of the necessary plant, &c., the cruisers *Niobe* and *Rainbow* were purchased from the British government, and stationed at Halifax and Esquimalt respectively. Both were employed in the Great War.

The Fisheries are, as regards the area available, the largest in the world. The coast-line of the Atlantic provinces, from the Bay of Fundy to the Strait of Belle Isle, without taking into account the lesser bays and indentations, measures over 5600 miles, and along this stretch are to be found innumerable natural harbours and coves. On the Pacific coast, the province of British Columbia, owing to its immense number of islands, bays, and fjords, which form safe and easily accessible harbours, has a sea-washed shore of 7000 miles. On both the Atlantic and the Pacific coasts, and within the limits of the territorial waters, are to be found fish and mammals in greater abundance probably than anywhere else in the world. Apart from this extensive salt-water fishing area, there are in the numerous lakes of the various provinces no less than 220,000 square miles of fresh water abundantly stocked with many excellent species of food-fish. In the deep-sea fishery of the Atlantic the fish caught are principally cod, haddock, halibut, hake, and pollack. The commercial food-fish taken inshore are cod, hake, haddock, pollack, halibut, salmon, herring, mackerel, alewives, smelt, flounders, sardines, lobsters, and oysters. On the Pacific coast salmon is predominant, but halibut and herring are very abundant. In the inland lake fisheries the chief commercial fish caught are whitefish, pickerel, pike, sturgeon, and herring—the latter in the great lakes of the province of Ontario only—besides many other less important kinds. There are employed in the actual work of fishing in the whole of Canada about 9000 men on board of vessels, and 50,000 in the various kinds of boats. The Dominion government has done much to foster the fisheries of the country. Bounties have been paid to fishermen, according to the catch and size of vessels and boats, to encourage them in the building and outfitting of improved craft. Many fish-breeding establishments have been built throughout the Dominion, and from these millions of fry of various kinds are placed in the rivers and lakes.

Minerals.—The most valuable minerals are coal, nickel, iron, silver, copper, gold, asbestos, natural gas, lead, salt, mineral oils, and gypsum. Most of the other commercial minerals are also mined. The gold production is principally from British Columbia and the Yukon district; but it is also mined in Ontario, Quebec, and Nova Scotia. There are immense fields in all these districts yet to be opened up. Silver is produced principally in the Cobalt district, Ontario, which is one of the greatest silver-fields in the world, and in British Columbia, where it occurs with lead. Copper is mined principally in British Columbia, where operations are on

a large scale, and in Ontario, where it is produced with nickel. Quebec also has a copper output. Sudbury, Ontario, produces over half of the nickel of the world. The silver ores of Cobalt, Ontario, furnish most of the cobalt. The eastern townships of Quebec furnish most of the asbestos supply of the world. Lead is extensively mined in British Columbia. Iron is found in all parts of the Dominion, but the main production at present is from Ontario. There are very large coal-deposits in Nova Scotia, Alberta, and British Columbia, those of the mountains in Western Canada forming one of the most extensive fields in the world. Notwithstanding the duty against it, Western Canadian coal finds a market in Alaska and as far south as San Francisco. Much has been expected of the great oilfield of the Mackenzie basin.

Forests.—The forest products of Canada constitute one of her most important sources of wealth. They find their way to all parts of the world—to the United States, to the United Kingdom, and to Australia. The Canadian sawmills are extensive and well appointed. The industry in all its stages employs a large number of men, as well as affording freight to railways and shipping. Among the wood are the maple (hard and soft), elm, hickory, ironwood, pine, spruce, cedar, hemlock, walnut, oak, butternut, basswood, poplar, chestnut, rowan, willow, black and white birch, and many more.

Agriculture.—Agriculture is the most important industry in Canada, and for the benefit of the farming community the Dominion government has established and maintains numerous experimental farms in different parts of the country. There are also a number of agricultural colleges, some of which are maintained by the provincial governments. The one at Guelph and the Macdonald College at Montreal are institutions of the very first rank, and attract students from all over the world.

The principal grain-crops of the country are wheat and oats, followed by barley. Hay and clover, rye, potatoes, flax, buckwheat, alfalfa, turnips and other roots are also important. The dairying industry has assumed large proportions in the older provinces, and is also making good headway in the newer districts in the west. Fruit is extensively grown in Nova Scotia, Ontario, and British Columbia. Large quantities of apples are exported to Great Britain, and an export trade is also being developed in pears and peaches. In many parts of the country the breeding of fine cattle, horses, and sheep is carried on successfully, the province of Ontario being especially noted for the excellence of its live-stock. Of late foxes and other fur-bearing animals have been bred in growing numbers, especially in Prince Edward Island.

Manufactures.—Since 1878 the development in manufacturing industries has been marked; but on the whole it may be said that the manufactures of Canada are as yet in their infancy. Agricultural implements are made for home use, and exported. There is sugar-refining in Halifax and Montreal, Quebec has tan-yards and boot and shoe factories, and the manufacture of cotton and woollen goods is increasing. The manufacture of articles of wood (doors, window-sashes, &c.) has also greatly increased. Canada is remarkably rich in water-power, which is being developed, especially for wood-pulp and electrochemical industries.

Fiscal Policy.—The percentage of duty on the total value of goods imported, dutiable and free, in 1868 was 12 per cent.; in 1878 it was 13.74; in 1879 the 'national policy' was inaugurated, and a general increase in the tariff sanctioned by parliament. No restrictions exist as to trade

between the different provinces, and free trade holds within the Dominion. The Intercolonial Conference of 1894 at Ottawa resolved in favour of a customs arrangement between Great Britain and her colonies, by which trade within the empire should be placed on a more favourable footing than trade with foreigners, and in 1898 this arrangement came into force, a reduction of 25 per cent. on the duty in favour of British goods being granted. In 1900 the reduction was raised to 33½ per cent. On 12th April 1907 the new Preferential Tariff came in force, giving a substantial reduction on goods imported from the British empire into Canada, but not a uniform reduction on the general tariff, different articles bearing different reductions in rate on the general tariff. Tariff revision continued to be an important political question. The Liberal victory in the election of 1921 was a setback to the policy of a high tariff.

Railways.—There are about 50,000 miles of steam railway open in Canada, besides 2000 miles of electric railways. The Canadian Pacific Railway was completed from ocean to ocean in 1871-85, its construction being one of the conditions under which British Columbia joined the confederation in 1871. Prior to 1880 the work was undertaken by the government, but in that year the Canadian Pacific Railway Company was formed, and undertook to complete the line by 1891 in consideration of a subsidy of \$25,000,000 and 25,000,000 acres of land, and the transfer of those portions of the line already under construction by the government (700 miles) when completed. The railway was finished in December 1885, nearly six years before the stipulated time, and through-trains have since then run daily from the Atlantic to the Pacific. By this route the distance from Liverpool to Japan and China is shorter by 1000 miles than *via* New York and San Francisco; and this trans-continental line is shorter by 600 miles than any of those in the United States. The railway is not only of importance locally to Canada, as connecting the various provinces and opening up the vast western provinces for settlement, but it is of imperial importance as providing a new route to Australia and the East, available for commerce and for military and naval purposes (see next paragraph). From Winnipeg it passes westward through Regina, Moose Jaw, Medicine Hat, and Calgary, through the Rockies by the Kicking Horse Pass to the lower Fraser valley and Vancouver. The journey from Europe to Asia is made even shorter by a second route. The National Trans-continental Railway runs from Moncton to Winnipeg. Westward of Winnipeg its continuation, the Grand Trunk Pacific, strikes across prairie-land well to the north of the Canadian Pacific, to Edmonton, through the Rockies near Mount Robson and down part of the upper Fraser valley to Prince Rupert. This trans-continental route was completed in 1914. A third route, the Canadian Northern, by Edmonton to Vancouver, was completed in the same year. In 1911 a line from Le Pas, Manitoba, to Port Nelson on Hudson Bay was begun. Except the Canadian Pacific and some smaller lines, the railways of Canada have been nationalised and united as the Canadian National Railways.

Shipping and Waterways.—At the end of 1918 the number of vessels registered in Canada, including those for inland navigation, was 4400 steamers and 4200 sailing-vessels, the total net tonnage of steam and sailing vessels being over 1,000,000. The sea-going vessels entering the ports in 1920 had a tonnage of over 25,000,000; and of coasting-vessels, 28,400,000. There are regular lines of steamers between Great Britain and Canada. Under arrangement with the respective govern-

ments, and assisted by subsidies, there is a service of mail steamers between Vancouver and Australia in connection with the Canadian Pacific Railway. This company has also in connection with it a regular service of steamers between Vancouver and Australia, China, and Japan, by means of which London is brought within three weeks of Japan. The canals of Canada have a length of only some 270 miles, taken in themselves; but they render available more than 3000 miles of inland navigation. Canals and the river improvements have cost a large sum of money, and they are works of great utility and importance. By their means vessels from the lake ports can reach the Atlantic without breaking bulk. The channel of the St Lawrence has been deepened, and vessels of 5000 and 6000 tons now reach Montreal, 700 miles from the Atlantic Ocean. There are nearly 5 miles of wharves at that city, and every facility for loading and discharging ships. At Quebec, also, there are facilities for an immense shipping trade. There is a system of canals to overcome the St Lawrence rapids and the difference in the levels of the great lakes (600 feet), which affords uninterrupted navigation from the Strait of Belle Isle to the head of Lake Superior, a distance of 2384 miles, of which 71½ miles are canals. The river Ottawa is navigated from Ottawa to Montreal, and there are considerable stretches of navigation above Ottawa. The rapids at Carlton, about half-way between Ottawa and Montreal, are overcome by locks; another river and canal system opens navigation between Ottawa and Kingston, and another between Lake Champlain and the St Lawrence. In Nova Scotia the St Peter's Canal connects St Peter's Bay with the Bras d'Or lakes. There is also navigation on the lakes and rivers in the western provinces and in the North-west Territories. For the Hudson Bay route, see the article HUDSON BAY.

Telegraphs.—There are 52,000 miles of telegraph lines, of which 13,000 belong to government, the remainder owned by private companies. The Pacific telegraph cable between British Columbia and Australia and New Zealand, *via* Fiji, is doing much to promote commercial intercourse between these dominions and the mother-country. Wireless telegraphy is also in use. Telephones are universal.

Revenue, Expenditure, and Public Debt.—The revenue for the financial year 1921-22, under the 'Consolidated Fund' account, comprising general sources of revenue and expenditure, was about \$382,000,000, of which nearly \$106,700,000 was from customs, and nearly \$36,750,000 from excise. The expenditure under the same account was \$347,500,000, of which \$139,000,000 was on debt charges. The gross public debt in 1922 was \$2,900,000,000.

National Parks.—The Dominion has an extensive system of national parks—areas set apart for the public benefit and enjoyment, for the sake of scenery, game, or other interest. These parks are administered by the Federal Government, which lays out town sites in which lots are rented at a purely nominal sum, builds roads and bridges, cuts out trails, and protects the game, fish, and timber. In the Rocky Mountains Park, on the eastern slope of the Rockies, are the celebrated Hot Sulphur Springs of Banff; and in Jasper Park, where the two trans-continental lines of the National Railways enter the Yellowhead Pass, between Alberta and British Columbia, are other hot sulphur springs with a temperature of 126°. Yoho and Glacier Parks in British Columbia are run on similar lines to the parks east of the Rocky Mountains, and each possesses very distinctive features. They have been compared to Gothic and Roman styles respectively of nature's mountain architecture.

The Wainwright Buffalo Reserve of 160 sq. m. in Alberta contains a herd of pure-bred Bison (q.v.), which under the protective care of the government are increasing rapidly; whereas before they were secured by the Dominion they were rapidly decreasing, and in a few years would doubtless have become extinct. Lands near Fort Smith have been reserved for the bison discovered in 1920. Other Dominion parks are Waterton Lake, Elk Island, Moose Mountain, and St Lawrence Islands. These latter consist of about a dozen islands among the Thousand Islands group in the St Lawrence River in Ontario, which were taken over by the Dominion to preserve them for the people, since they were being rapidly bought up by millionaires for their own exclusive enjoyment.

Relation to the United States.—Between countries situated as are Canada and the United States it is inevitable that the relations should be close, complicated, and delicate. Specially troublesome were the Alaska (q.v.) frontier difficulty (finally adjusted in 1903), the Behring Sea seal-fishery question (see SEAL), and the rights of United States fishermen in Canadian waters. Reciprocity is sometimes discussed, especially in the prairie provinces, but the minds of the Canadian people turn more to the strengthening of the trade relations with Great Britain, with Australia, and with New Zealand. The Liberal Laurier government went to the country advocating commercial reciprocity with the United States, but was defeated by a large majority; a Conservative government, hostile to reciprocity, being formed under (Sir) R. L. Borden. The question of annexation, which at one time received some attention outside Canada, mainly through the writings of the late Professor Goldwin Smith, is dead, and few Canadians expect ever to see it revived. That independent representation at Washington should be sought was a natural consequence of the new status of Canada as a signatory of the peace treaties of 1919-20, and a member of the League of Nations.

Constitution.—The government is federal. The provinces have local legislatures. The executive government and authority of and over Canada is vested in the sovereign. The Governor-general for the time being, whose emoluments are paid out of the Canadian revenue, carries on the government in the name of his Majesty, with the assistance of a council, known as the cabinet, consisting of the heads of the various departments, which is responsible to the Canadian House of Commons. The Dominion parliament, which sits at Ottawa, consists of an Upper House, styled the Senate, and the House of Commons. The senators are nominated for life by the Governor-general in council. The Commons are elected every five years, unless the House be dissolved before its course has run. Quebec has 65 members; the other provinces have their representatives adjusted in proportion to population after every census. There is a special franchise distinct from that in force for the provincial assemblies; both are liberal and extensive. Women were enfranchised in 1917-18. The procedure is very much the same as in the imperial parliament at Westminster. At the head of each of the provinces is a Lieutenant-governor, appointed by the Governor in council and paid by the Dominion, who is the medium of communication between the provinces and the Federal Government. In Quebec and in Nova Scotia there are two Houses of legislature, but in the other provinces there are only single Houses. This, however, is a matter entirely within the control of the local authorities, as are also the election of members, franchise qualifications, and alteration of electoral districts. The executive in each province is responsible to the local legislature. The North-west Territories are

administered by a chief executive officer known as the Commissioner, under the direction of the Governor in council or the Minister of the Interior, the Commissioner having a council of not more than four in number to assist him. Yukon has a 'Gold Commissioner' and an elected territorial council. The powers of the respective Dominion and provincial parliaments, and the contributions to the revenues of the provinces from the Dominion treasury, are defined by the original act and amending acts. Legislation upon local matters is delegated, as a general rule, to the provinces. See **FEDERATIONS AND UNIONS**. There is also a very perfect system of municipal government throughout the Dominion. Both counties and townships have their local councils, which regulate the taxation for roads, schools, and other purposes, so that every man directly votes for the taxes he is called upon to pay. Local taxation is very light.

History.—In 1534 Jacques Cartier, a French navigator, a native of St Malo, set out from that port with two small vessels of 20 tons each, landed on the shores of Gaspé (now part of the province of Quebec), and took possession of the country in the name of his sovereign, Francis I. He went again in the following year, and reached a small bay opposite the island of Anticosti. This bay he named St Lawrence, and the name is now applied to the gulf and river up which he sailed before reaching Stadaconé, near the site of the present city of Quebec. Continuing his voyage, he arrived at Hochelaga, another Indian town, and gave it the name of Mont Royal (Montreal). After passing the winter at Stadaconé he returned to France. But little or nothing was done to promote the colonisation of the country until 1608, when Samuel Champlain, a Frenchman of gentle birth and maritime and military experience, and much religious enthusiasm, visited Canada for the third time, with the object of extending Christianity and developing trade and commerce, and founded the city of Quebec, the name of which is said to be derived from an Indian word, *kepek*, 'the narrows.' The control of the immense region, extending eastward to Acadia (Nova Scotia), westward to Lake Superior, and down the Mississippi as far as the Gulf of Mexico, was from this time until 1763 claimed by France (see **ACADIA**). Recollet and Jesuit missionaries traversed it in all directions, suffering great hardships in their endeavours to convert the Indians. Their work was watched with much enthusiasm in France, and it is admitted that they were the first explorers of the country and the pioneers of civilisation in the Far West.

The claims of France were not, however, undisputed, as is shown by the grant by a charter of Charles II. in 1670 to Prince Rupert and his company, known ever since as the Hudson Bay Company, of the exclusive right of trading in the territory watered by streams flowing into Hudson Bay. As already mentioned, they gave up their exclusive rights in 1869 on certain conditions—among others, a money payment of £300,000 and a large grant of land. The struggle between Great Britain and France for supremacy in North America was long and bitter, but it terminated finally in 1763 by the cession to the former, under the Treaty of Paris, of Canada with all its dependencies, except the islands of St Pierre and Miquelon, which were retained as fishing stations, not to be fortified or garrisoned. Hudson Bay with the adjacent territory, Nova Scotia, and Newfoundland had been previously transferred to England by the Treaty of Utrecht in 1713. The population of Canada in 1763 was about 70,000; of Nova Scotia, 8000. No time was lost in attempting to adapt British institutions to the new possession; but

considerable friction occurred for some years, and it was not altogether allayed by the passing in 1774 of what is known as the Quebec Act. This gave the French-Canadians the free exercise of their religion, and secured their civil rights, laws, and customs. It annexed large territories to Quebec, including that part of the United States now forming Minnesota, Wisconsin, Michigan, Ohio, Indiana, and Illinois, which passed from Great Britain in 1783. Quebec was eventually in 1791 divided into Upper and Lower Canada; but this did not prove satisfactory in either province, leading to conflicts between the popular and elected assemblies and the nominated or official councils, and ultimately to the rebellion in 1837–38.

In accordance with Lord Durham's recommendations, the two provinces were reunited in 1840 (population of Upper Canada, 450,000; of Lower Canada, 650,000), but the union was not a success politically, although it indirectly led to the great confederation in 1867. It should be mentioned that the inhabitants of Upper Canada consisted largely of United Empire loyalists, who adhered to British institutions, and who left the United States at the close of the War of Independence, while those of Lower Canada were almost exclusively French-Canadians. The representatives from each province in the united parliament were equal in number. Upper Canada, however, made greater progress than Lower Canada (the population in 1851 was 952,004 and 890,261 respectively, and in 1861, 1,396,061 and 1,111,566), and agitated for an additional number of members and claimed other concessions, but the demands were always opposed by the latter. The consequence was frequent legislative deadlocks and continual difficulties. Such was the state of things in 1864. It is now necessary to refer to the other colonies on the Atlantic and Pacific coasts. In 1770 St John Island (renamed Prince Edward Island in 1780), and in 1784 New Brunswick, were formed out of Nova Scotia into separate colonies. In 1858, owing to the rush for gold and the influx of population, British Columbia was made a crown colony, and in 1866 Vancouver Island was joined to it. In 1864 the Maritime Provinces were discussing the desirability of local confederation, and advantage of the opportunity was taken by Canada to propose a broader scheme to cover all British North America, and after several conferences a basis of union was agreed upon which resulted in the formation of the Dominion.

Since the confederation of the provinces, the chief events of importance may be put in the following tabular form:

- 1869. The Red River rebellion, which collapsed in August 1870, on the arrival at Fort Garry of the expedition under Colonel (Lord) Wolseley.
- 1871. Treaty of Washington, dealing, among other things, with the fisheries and the use of certain canals.
- 1873. Defeat of the Conservative ministry (Sir John Macdonald, premier) on Pacific Railway question.
- 1877. Award of the Halifax Fishery Commission in favour of Great Britain of 5,500,000 dollars, as representing the value of the fishing privileges granted to the United States, over and above the concessions made to Canada under the Washington Treaty.
- 1878. Defeat of the Liberal ministry of the Hon. A. Mackenzie.
- 1879. Adoption by new Conservative ministry of the higher customs tariff, called the national policy, as a measure of protection against the United States.
- 1880. Contract for construction of Canadian Pacific Railway signed; ratified by parliament in 1881.
- 1885. Outbreak of disturbances among the half-breeds, under Louis Riel, in the Saskatchewan district, North-west Territories, in March. Suppressed in July by the force under Major-general Middleton. The total force in the field was about 4000 men

- of the Canadian militia. Louis Riel tried, condemned to death, and executed. Last spike of the Canadian Pacific Railway driven (November 7).
1886. The first through-train for the Pacific left Montreal (June 13).
1887. Local Act passed for construction of Red River Valley Railway to boundary line to connect with United States railways. Act disallowed by governor in council. Agreement arrived at between the British and United States governments to discuss fishery disputes in conference at Washington. British plenipotentiaries, Mr Chamberlain, Sir Lionel Sackville West, and Sir Charles Tupper.
1888. Treaty for the settlement of the fishery disputes signed by the British and United States representatives (Feb. 15), subject to ratification by legislatures of respective countries. Recognised right of Canada to fisheries in three-mile limit; United States fishing-vessels to be allowed to land, sell, and tranship cargoes only in cases of distress; may enter the ports for wood, water, shelter, and repairs; and, on obtaining a licence (given without charge), to purchase casual supplies and stores (excepting bait). Meantime, to avoid friction, a *modus vivendi* was offered, providing that United States fishing-vessels might have all the privileges mentioned above on payment of a tonnage licence fee of 1.50 dollars per ton. The United States Senate refused ratification. The *modus vivendi* subsequently renewed. Motion for unrestricted reciprocity between United States and Canada rejected by the Dominion House of Commons.
1889. Proposal that the governor-general should have independent action in foreign affairs disapproved by parliament. Act restoring the property of the Jesuits; petition against it disallowed by the government.
1891. Death of Sir John Macdonald. Some officials tried for corruption.
1892. Treaty of Arbitration between Great Britain, Canada, and the United States as to the rights of seal-fishing off Alaska and in Behring Sea.
1893. Award of the Behring Sea Arbitration Court. Establishment of direct steam communication between Canada and Australia. Ratification of the Behring Sea Treaty.
1894. Intercolonial conference at Ottawa on a Pacific cable between Canada and Australia, and the promotion of commercial intercourse between the Colonies and with Great Britain.
1895. Franco-Canadian commercial treaty.
1896. Religious educational troubles in Manitoba settled. (Sir) Wilfrid Laurier first French-Canadian and Catholic premier.
1897. New tariff favouring trade with Britain and the other colonies. Gold-fever at Klondike.
1898. Conference at Quebec between Britain, the United States, and Canada about the frontier of Alaska (q.v.), fishery regulations for the great lakes and the North Atlantic, the import duties on Canadian timber, alien labour laws, and reciprocity of trade between Canada and the United States.
- 1899-1902. 9200 Canadian troops sent to South African war.
1902. Completion of the Pacific cable to Australia.
1903. The Alaska boundary defined.
1905. Saskatchewan and Alberta, two new provinces, created.
1906. Canada takes control of Halifax garrison.
1907. New postal convention with United States. Quebec bridge disaster.
1908. French treaty.
1910. Award of Hague Tribunal finally settles fishery disputes between the United States on the one hand and Canada and Newfoundland on the other. Inception of Canadian navy by purchase of two warships from the British government.
1911. Overthrow of the Laurier (Liberal) government on the question of commercial reciprocity with the United States, and formation of a Conservative cabinet under (Sir) R. L. Borden.
1912. Preferential trade agreement between Canada and the West Indies arranged. Great Congress of the French race at Quebec, to consolidate their interests and promote the claims of their language.

- Destructive cyclone at Regina (30th June). Quebec, Ontario, and Manitoba extended.
1913. Trade agreement with West Indies.
1914. Great European War. Grand Trunk Pacific Railway and Canadian Northern Railway (Ontario section) completed.
1915. First Canadian contingent lands in France. First Canadian War Loan.
1916. Houses of Parliament, Ottawa, destroyed by fire.
1917. Sir R. L. Borden in Imperial Cabinet. Military Service Act. Quebec Bridge completed. Women's franchise (partial). Coalition ministry (Sir R. L. Borden). General election: no change.
1918. Women's franchise (extended).
1919. In the Peace Conference at Versailles and in the League of Nations Canada takes full rank as a nation. Death of Sir W. Laurier.
1920. Rebuilt Houses of Parliament opened. New trade agreement with the West Indies signed. Mr Arthur Meighen premier in succession to Sir R. L. Borden.
1921. Coalition defeated in general election. Mr William Lyon Mackenzie King, Liberal leader, becomes premier.

The governors-general of Canada since 1867 have been: Lord Monck (1867-68), Lord Lisgar (1868-72), Lord Dufferin (1872-78), Lord Lorne (1878-83), Lord Lansdowne (1883-88), Lord Stanley of Preston (1888-93), Earl of Aberdeen (1893-98), Earl of Minto (1898-1904), Earl Grey (1904-11), Duke of Connaught (1911-16), Duke of Devonshire (1916-21), Lord Byng of Vimy.

The progress of Canada since confederation has been very rapid, but its varied resources are still in great measure undeveloped. Recent events, particularly the extension of railways and the completion of the trans-continental system, have placed Canada in a position of advantage which she had not previously occupied, and increased the volume of immigration to the immense areas of unoccupied, fertile lands; the agricultural, manufacturing, and mining industries are becoming more important every year; trade is expanding both at home and abroad; and the wealth of the people is rapidly becoming greater.

Literature.—Canada has been making steady progress in literature, and the future is full of promise in this respect; Judge Haliburton ('Sam Slick'), Joseph Howe, Sir William Edmond Logan, Sir William Dawson, Alpheus Todd (in Constitutional History), Bourinot, Grant Allen, G. J. Romanes, Simon Newcomb, Sir John Murray, and J. B. Crozier achieved a wide reputation at home and abroad. C. G. D. Roberts, Bliss Carman, Wilfred Campbell, and Duncan Scott are favourably known as poets, and Sir Gilbert Parker as a story-teller. L. H. Fréchette of Quebec was crowned (1880) the poet of the year by the French Academy. Other French-Canadian writers are Garneau, Chauveau, Poisson, Crémazie, Chapman, and Nelligan (the last two in spite of their un-French names). Dr W. H. Drummond (Irish-born) wrote humorous and tender poems in the mixed French-English patois of the *voyageurs* and half-breeds. Sir Daniel Wilson and Professor Goldwin Smith, like Mr R. W. Service and Professor Stephen Leacock, were only Canadian by adoption. Mr Bonar Law, the British Conservative leader, is Canadian-born.

For the relation of the British colonies to the French in Canada, see UNITED STATES (*History*); see also the articles AMERICAN INDIANS, COLONY, EMIGRATION, ESKIMOS, FEDERATIONS AND UNIONS, MACDONALD (Sir J. A.), the articles on the several provinces of the Dominion, and such articles as APPLE, CHEESE, DAIRY. Besides works cited in Morgan's *Bibliotheca Canadensis* (Ottawa, 1867), reference may be made to the *Histories of Canada* by Faillon (French, 2 vols. Mont. 1865), Tuttle (Boston, 1878), F. X. Garneau (French, 4 vols. Mont. 1883; revised by H. Garneau, 1921), Dent (Toronto, 1883),





Reveillard (French, 1884), Bryce (1887; new ed. 1914), Kingsford (8 vols. 1888 *et seq.*), C. G. D. Roberts (1898), Tracy (1908), Bradley (1911), Sir C. P. Lucas (1911), Bourinot (ed. Ingram, 1922). See also Parkman's works (1872-84); Confederation Debates (1865); Todd's *Parliamentary Government in the British Colonies* (Boston, 1880); *Her Majesty's Colonies* (1886); Grant's *Ocean to Ocean* (1873) and *Picturesque Canada* (2 vols. Toronto, 1884); Ryerson's *Loyalists of America* (1880) and *Story of my Life* (1883); Sanford Fleming, *Intercolonial Railway* (1876); *Pacific Railway* (1880); the Marquis of Lorne's *Canadian Life and Scenery* (1885); Émile Petitot, *Traditions Indiennes du Canada Nordouest* (Paris, 1886); Silver's *Handbook*; Dawson on *Canada in North America* ('Stanford's Compendium'); the annual *Statistical Abstract and Record of Canada* (first published in 1886); Clapin, *La France Transatlantique* (Paris, 1885); Lowell's *Gazetteer and History of Canada* (1887-89); guidebooks, such as those of Roberts (1891) and Baedeker (1922); Goldwin Smith's *Canada and the Canadian Question* (1891); *Canadian Poems and Lays*, edited by Lightfall (1893); Taurine's *La Nation Canadienne* (Paris, 1894); Creswell (1894); Justin Winsor's *Cartier and Frontenac* (1895); MacMurphy's *Canadian Literature* (1906); R. P. Baker's *English Canadian Literature to the Confederation* (1921); *The Oxford Book of Canadian Verse*, edited by Wilfred Campbell (1913); *Canada* painted by a Canadian painter, T. M. Martin, and described by a Canadian author, Dr Wilfred Campbell (1907); Griffith's *Dominion of Canada* (1911); *Historical Geography of British Dominions and Colonies*, vol. v.; *The Oxford Survey of the British Empire*, vol. iv. (1914); Lucas's edition of Lord Durham's famous *Report* in 1839 (3 vols. 1912); *Canada and its Provinces*, edited by Shortt and Doughty (23 vols. 1913-17); *Chronicles of Canada*, edited by Wrong and Langton (1914-16); Kennedy, *The Constitution of Canada* (1923).

Canada Balsam is a kind of Turpentine (q.v.) obtained from the Balsam Fir or Balm of Gilead Fir (*Abies balsamea*), a native of Canada and the northern parts of the United States (see FIR). It exists in the tree in vesicles between the bark and the wood, and is obtained by making incisions. It is a transparent liquid, almost colourless, and with an agreeable odour and acrid taste. It pours readily out of a vessel or bottle, and shortly dries up, and becomes solid. When fresh it is of the consistence of thin honey, but becomes viscid, and at last solid by age. It consists mainly of a resin dissolved in an essential oil, and its composition is approximately: essential oil, 24 parts; resin, soluble in boiling alcohol, 60; resin, soluble only in ether, 16. Canada balsam was formerly employed in medicine as a stimulant for the cure of mucous discharges, and as a detergent application to ulcers, but it is now rarely used as a remedy. The balsam is much valued for a variety of purposes in the arts—as an ingredient in varnishes, in mounting objects for the microscope, in Photography (q.v.), and by opticians as a cement, particularly for connecting the parts of achromatic lenses to the exclusion of moisture and dust. Its value depends on its perfect transparency, and on its having a refractive index nearly equal to that of glass. See BALSAM.

Canadian Hemp. See APOCYNACEÆ.

Canadian Pondweed. See ANACHARIS.

Canadian River rises in the NE. part of New Mexico, and runs generally eastward through Texas and Oklahoma to the Arkansas. Its length is about 900 miles, but it is rather shallow and not important for navigation. Its largest tributary is the Rio Nutria, or North Fork of the Canadian, which runs parallel to the main stream for about 600 miles.

Canagire, a species of dock (*Rumex hymenosepalus*) found in Texas and New Mexico, whose root yields a tanning material.

Canaletto, or CANALÉ, the name of two Venetian painters, celebrated for their landscapes

and views of towns. The elder, ANTONIO, was born in 1697, and studied at Rome. He painted a series of views in Venice, among which those of the Grand Canal are especially admirable for their fresh colouring, faithfulness, and the invention displayed in accessory objects. He paid two visits to England, but died in his native city, 20th August 1768.—His nephew, BERNARDO BELLOTTO, surnamed CANALETTO, was born in 1720, and attained high excellence as a painter, and also as an engraver on copper. He practised his art in his native place, and afterwards in Rome, Verona, Brescia, Milan, and Dresden. Correct perspective, powerful effects of light and shade, and beautiful sky-tints are the most prominent characteristics of his works. Canaletto visited England, where, among several other excellent works, he painted a masterly interior of King's College Chapel, Cambridge. He died in Warsaw, 17th October 1780.

Canals are artificially constructed water-channels used for drainage of low-lying land, for irrigation purposes, or for navigation by boats, barges, or ships. The first canals were constructed in early times for irrigation in Assyria and Egypt, though they were also probably used for navigation.

Drainage Canals.—These are artificial water-courses to supplement the natural rivers in areas where the rivers have a small fall, and the adjacent lands, being low-lying, are liable to flooding in wet seasons unless artificial channels are provided as an additional means for the discharge of surplus rainfall. Many instances of such canals exist in Holland, in the Fen districts of Lincolnshire and Norfolk, where they are usually called cuts or drains, and even in such a generally dry country as Australia there are large areas where they have had to be provided in order to allow the land to be brought under cultivation. Such canals differ from Rivers (q.v.) merely in the fact that they are straight artificial cuts. Being usually constructed in districts where there is only a small slope to the sea, they must be given an exceptionally large cross-section in relation to the normal flow, since the discharge in any stream or canal is, other things being equal, determined by the amount of fall in feet per mile. Where flood discharges are likely to be heavy, inundations may be prevented by utilising the material excavated in forming the channel for embankments on either side, placed a little back from the edges of the cutting.

Irrigation Canals.—The purpose of such canals is to carry the waters of a river flowing through a hot, dry country to land at a distance from the river so as to preserve such land from the effects of drought and so increase its fertility. The two countries where this system of irrigation has been most extensively employed are Egypt and India, though very important works of this class have been carried out in Italy and Spain, and in more recent years in Colorado, California, and in Australia in the Murrumbidgee valley. Those canals are made with a regular slope or fall, and by increasing the fall a greater volume of water will be conveyed by a canal of given cross-section; but if the fall is too great, the scouring action of the water on the bed of the canal becomes injurious, as happened in the case of the Ganges Canal. Sluices and weirs have to be constructed at the intakes of such canals to regulate or shut off, if necessary, the supply. Provision has also to be made for the admission of the water from the main canal into the branch canals and trenches which distribute the water over the irrigated area. The details in regard to all these works appertain to Irrigation (q.v.), and the formulæ employed for determining the sizes of the canals, given the available fall and the volume of water required, are determined by the principles of hydro-mechanics.

Navigation Canals.—Though it is possible to utilise drainage and irrigation canals for navigation purposes, they are designed primarily for the passage of water; on the other hand, navigation canals are level still-water channels constructed as a waterway for vessels, just as roads and railways are formed for vehicles and trains. Canals differ, however, in one important aspect from roads and railways—they cannot adapt themselves by varying gradients to the irregularities of level of the country they traverse; they must consist of a series of level reaches, at different heights above datum, connected at their extremities by locks or other means for transferring boats from the level of one reach to that of the adjoining reach. As a result, the laying out of the route of a canal is a more difficult problem than that of railways, as it is necessary, without unduly lengthening the route, to secure as long level reaches as possible; cuttings, embankments, tunnels, and aqueducts are all employed to facilitate this object.

A canal should in general be wide enough to allow two of the largest barges or boats navigating it to pass easily; to avoid undue resistances to traction it is advisable to make the bottom width at least twice the greatest breadth of the boat, the depth one and a half times the greatest draught of the boat, and the section of the waterway about six times the greatest midship section of the boat, which means in Great Britain a bottom width of 25 to 30 feet, a top width of 40 to 50 feet, and a depth of 4 or 5 feet. The bottom is flat, the sides have slopes of $1\frac{1}{2}$ to $2\frac{1}{2}$ per foot of height, but in towns, and sometimes in other parts where it is advisable, vertical stone side walls are used; these form quays. In tunnels and deep cuttings the width is usually only sufficient for a single boat, passing places being provided at suitable intervals. On embankments and along cuttings in porous soils a watertight lining of well-puddled clay or concrete has to be employed in order to prevent leakage. To prevent erosion of the sides at the water-line by the wash produced by the moving boats it may be necessary to pitch the sides with stones. A towing-path along one side of the canal, raised about 2 feet above the water-level, affords facilities for haulage.

An ample supply of water is needed for all canals in order to make up the water losses due to leakage, evaporation, and lockage. Loss due to leakage can be reduced to a minimum by strict maintenance of the channel and by proper attention to lock gates; the loss by evaporation is proportional to the water surface, and is naturally greatest in the summer, when the supply of water is least. The expenditure of water in locking depends on the size of the lock chambers, the height of lift, and the amount of traffic on the canal. In low-lying districts and in river valleys there is usually no difficulty in supplying water to canals; the natural streams can be utilised to introduce a supply to the canal at various points. Where, however, a canal rises to the higher level and crosses a watershed—that is, when we have to deal with the summit-level reach—it is often difficult to obtain an adequate supply of water, and artificial reservoirs (see *WATER*) have to be constructed at such a level as to provide the necessary water by gravitation to the canal. Such reservoirs may be formed by building an embankment across the valley of a mountain stream, and thus storing up the winter flow of the stream. To reduce the difficulty due to loss of water in locking various other expedients have been adopted for raising and lowering vessels from one reach to the next, when the lift is considerable. Vessels may be transferred from one reach to the next by locks, inclines, or lifts.

Lock.—A lock is a watertight chamber constructed of wood, brickwork, masonry, or concrete, provided with gates at each end, which separates two adjacent reaches. This chamber can be filled or emptied by sluices, and this enables a vessel to be admitted from either reach, and then raised or lowered to the level of the next reach. Where the difference of level is great a series of locks is placed end to end in steps, forming what is called a flight of locks. When the traffic is large locks involve a considerable expenditure of water, for a lockful of water is used for each pair of boats passing a single lock when boats ascend and descend alternately. With a flight of locks there is the least expenditure of water when the boats ascend or descend in a series; on the other hand, each pair of boats passing up and down alternately requires as many lockfuls of water as there are locks in the flight. In order to save water a second flight is sometimes built alongside the first flight, the one flight being used by ascending, the other by descending, barges. Side ponds are also sometimes used, into which the upper layers of water can be discharged when emptying a lock, and used again for refilling the lock. For further details, see *LOCK*.

Inclines.—Occasionally when water is scarce, and the lift is large, vessels are conveyed on an incline from one reach to the next on a special carriage running on rails, laid on the incline and controlled by a cable. The vessel may be lifted on a cradle out of the water, which is apt to set up severe strains in the vessel's hull, or it may be floated into a steel caisson or trough containing water, with gates at either end, the caisson being supported on a frame in such a manner that it remains horizontal as it moves up or down the incline. While this second method is better as regards the strains likely to be caused in the vessel's hull, it means that a much heavier load due to the water in the caisson has to be moved. By connecting the cables of the ascending and descending loads on to a drum at the top of the incline the power expended in the haulage is much reduced.

The first incline with counterbalanced carriages running on rails was employed on the Ketley Canal in Shropshire in 1788, the height of lift being 73 feet, and they were afterwards adopted on many other canals. On the Morris Canal in New Jersey, U.S.A., there are twenty-three inclines with an average lift of 58 feet, on which 80-ton boats are drawn in cars up an incline of 1 in 10. Caissons were first adopted on the Chard Canal in Somersetshire about 1840, and later, on a larger scale, at Blackhill, on the Monkland Canal near Glasgow, the lift being 96 feet, the incline replacing a double flight of locks. On the canal which connects the Chesapeake and Ohio Canal with the Potomac (U.S.A.), at the incline at Georgetown a caisson weighing when full 390 tons was put into operation in 1876; the incline is 1 in 12, and the lift 39 feet; boats of 115 tons are transferred from the lower to the upper reach in eight to sixteen minutes, steel cables are employed, and power is obtained from water-turbines.

Lifts.—A canal lift consists of two steel troughs filled with water, which counterbalance one another, one going up as the other descends vertically. The lift has various advantages over a flight of locks; it economises water, time, and space, and in certain circumstances the cost of construction may be less.

Hydraulic canal lifts were introduced in 1875 at Anderton for connecting the Weaver with the Trent and Mersey Canal, the lift being 50½ feet. This lift consists of two troughs, 75 feet long by 15½ feet wide, containing 5 feet of water; each trough is supported in the centre by a hydraulic

ram. These two troughs balance one another, and the lift is mainly obtained by removing 6 inches in depth of the water from the lower trough, the final part of the lift being obtained by the use of the 36-inch diameter ram under this trough. A barge of 100 tons can be lifted in two and a half minutes, and barges can be transferred from one level to the other in both directions in eight minutes; on a flight of locks for a similar lift over an hour would be required for this operation. Another example is the lift at Les Fontinettes near St Omer, France, where the lift is 43 feet, and the troughs are $132\frac{1}{2}$ by $18\frac{1}{2}$ feet, with a depth of water of $6\frac{1}{2}$ feet; this replaced also a flight of locks, and can deal with vessels of 250 tons, and a total load of 785 tons. At La Louvière, in Belgium, where there was a difference of level of 220 feet in 5 miles, four lifts have been employed of still larger capacity, capable of lifting vessels of 400 tons, with a total load of 1100 tons.

Haulage.—The typical method in small canals is still horse-haulage, the horse walking along the tow-path. This is a very slow method of transport; a horse hauls a loaded narrow boat at about 2 miles per hour, and when empty at about 3 miles per hour. The difficulty in introducing any quicker method is the damage to the banks by wash when the speed exceeds $3\frac{1}{2}$ miles per hour. For every depth of canal there is maximum speed for economy, due to the speed of free propagation of the primary wave set up by the movement of the barge. On larger canals steam haulage is utilised; steam-tugs hauling trains of barges as on rivers are employed. The Aire and Calder Navigation affords a good instance of the application of this method. Cable traction has also been employed, and electric tractors running on rails have been used.

Inland Canals.—The invention of locks in the 14th or 15th century made possible the modern development of canals for the transport of goods. The Languedoc Canal (Canal du Midi) may be looked upon as the first important navigation canal constructed in Europe (1666–81). It was designed by Baron Paul Riquet de Bonrepos, and provided direct connection of the Bay of Biscay with the Mediterranean, thus avoiding the long detour by the Straits of Gibraltar. The canal is 148 miles long, rises 600 feet above sea-level at Naurouse, the number of locks being 119, and the depth of water $6\frac{1}{2}$ feet, suitable for vessels of 100 tons. It is proposed to enlarge the canal so as to render it available for sea-going vessels. The French government has pursued a vigorous policy of development of inland waterways, and a large proportion of the bulky goods are conveyed by water in France. There are about 3000 miles of canals and over 4000 miles of navigable rivers in that country, many of the waterways being free of all tolls, the costs of maintenance and construction being borne by the state. In 1879 a law was passed fixing definite dimensions of all locks, depth of water in the channels, headway under bridges, &c., and when the alterations involved are all carried out it will be possible for boats of 300 tons with 6 feet draught to traverse all the principal waterways of France.

Canals were introduced into Holland and Belgium in the 12th century, and being, in that flat country, practically independent of locks, they were rapidly developed, until at the present time no other countries are better provided with inland waterways.

In Russia, Peter the Great began the construction in the 18th century of an important system of canals. The Volga and the Neva are connected by a canal which permits the passage of vessels of 500 to 1000 tons; other canals of equal importance have been constructed or planned, including one joining the Volga and the Don, thus providing a

passage from the former, greatest of all European rivers, to the Black Sea.

In Great Britain the earliest canals were the Foss Dyke and the Caer Dyke, constructed by the Romans, the former being still navigable; it extends from Lincoln to the river Trent at Torksey. It was not, however, till the close of the 17th century that modern canal construction began in this country, when the Aire and Calder Navigation was opened; but it was to the energy and resources of the Duke of Bridgewater (q.v.) and to the engineering skill of James Brindley (q.v.) that we owe our present system of canals, the first extensive work they undertook being the Bridgewater Canal, opened in 1772. From 1788 to 1805 there was a period of intensive activity in canal construction; a canal mania, similar in many ways to the railway mania of later days, lasted from 1791 to 1794. After 1834, when the railway development had fairly started, canal construction came to an end. There are about 3050 miles of canals in England, 154 miles in Scotland, 609 miles in Ireland, or a total of 3813. The traffic on many of these canals has now diminished to a very low figure, but some of them still maintain a heavy traffic, and compete successfully with railways. Unfortunately many of the canals fell into the hands of railway companies, who allowed their canals in many instances to fall into disuse. Had they been modernised and standardised, as has been the case in France, there is little doubt that a good traffic could have been maintained, with great advantage to the country as a whole. A royal commission was appointed in 1906 to report on the whole subject of internal waterways in this country, and if the proposals in their report of December 1909 are fully carried out, there will be a great development of this system for the transport of heavy, bulky goods, which do not require such rapid transportation as is provided by railways. The most important canals in Great Britain are the Gloucester and Berkeley Canal, 17 miles in length, with a depth of 15 feet; the Aire and Calder Navigation, with a depth of 9 feet; the Caledonian Canal (q.v.), with a depth of 17 feet; and the Forth and Clyde Canal, with a depth of 10 feet.

North America, with its vast extent and large rivers and lakes, affords ample scope for canals uniting separate navigations. The first canal in the United States was constructed in 1793, and there was from this period onwards a great development, until further expansion was greatly checked by the growth of the railway system. The most noteworthy canals in the United States are the Erie Canal, which connects Lake Erie with the Hudson River, which has a length of $365\frac{1}{2}$ miles, and a total rise of $656\frac{1}{2}$ feet, and a depth of $7\frac{1}{2}$ to $9\frac{1}{2}$ feet, sufficient for vessels of 240 tons; and the Chesapeake and Ohio Canal, of about the same size as the former. In Canada the artificial waterways so far constructed are largely 'lateral' canals, built to allow vessels to avoid the rapids in the rivers—such, for example, as the Welland Canal, avoiding the rapids and the falls of Niagara, and the St Lawrence Canal between Lake Ontario and Montreal. These canals have been greatly increased in depth and cross-sections since their first construction, and many millions sterling have been expended in the work, with a view of facilitating and cheapening the transport of the enormous grain crops of western Canada to the eastern shipping ports.

Ship-canal.—These are canals of large dimensions, capable of admitting vessels of great size, such as large ocean-going steamers. They are designed either to cut across isthmuses, and thus greatly reduce the distance by sea between certain countries—the Suez, Corinth, and Panamá Canals are

instances of this type—or to place great inland towns in direct communication with the sea—as, for example, in the case of the Manchester and the Amsterdam Canals—or they may be primarily intended for military defence purposes, though at the same time ostensibly for commercial development, as was the case with the Kiel Canal.

Suez Canal.—A canal connecting the Nile Delta with the Red Sea was constructed probably by Rameses II., and we have early Egyptian records of the existence of such a canal. It apparently became blocked, but was reopened about 520 B.C. by King Darius I. of Persia. During the Roman period certain repairs were carried out; but it was the Arab conquerors of Egypt who again thoroughly repaired and cleared the canal, making it serviceable for navigation. Part of this old canal was used in connection with the construction of the Sweet Water Canal during the building of the present Suez Canal.

The project of direct communication between the Mediterranean and the Red Sea had been under

secured the support of the new viceroy Said Pasha, who gave De Lesseps a concession authorising the promotion of a company to construct a ship-canal across the isthmus, and the Universal Company of the Maritime Suez Canal was formed, receiving valuable concessions from the Egyptian viceroy. In a further concession granted in 1856 the company agreed to construct, in addition to the lock-free maritime canal, a fresh-water canal from the Nile to Lake Timsah, with branches from this point to the northern and southern ends of the sea canal. The concession was for a period of ninety-nine years from the date of the opening of the maritime canal. The confirmation of the sultan of Turkey was necessary to validate these concessions, but, owing to British opposition, this confirmation was not actually granted till 1866. In the meantime the necessary capital was raised, mainly in France and in the Ottoman Empire, practically no support being obtained from Great Britain. On 25th April 1859 the first spadeful of earth was turned at Port Said, the Mediterranean terminus of the canal. Progress was at first slow, and in 1862 further delay was caused by the necessity of completing the fresh-water canal. Up to this date the work had been mainly carried out by native labour, as laid down by the two concessions. But in 1863 Said Pasha died, and the new khedive, Ismail Pasha, refused to sanction the continuance of this forced labour scheme; the khedive also refused to ratify the concessions originally granted to the company. These disputes were eventually settled by the matter being referred for arbitration to the Emperor Napoleon III., and the company received as a compensation for cancellation of certain parts of the concessions £3,800,000. When forced labour was stopped the whole remaining work was divided into four contracts, and modern mechanical appliances for excavation were introduced, and as a result much more rapid progress was made; and on 17th November 1869 the canal was duly opened by a procession of sixty-eight vessels, the leading vessel having the Empress Eugénie on board. The flotilla reached Suez on 20th November.

The total length of the canal is 100 miles; the width at the bottom at first was 72 feet, the width of the water surface varying from 150 to 300 feet; and the depth was 26 feet. The total cost was about £20,000,000, more than double the estimated cost for a larger canal as worked out by the International Technical Commission of 1856. At Port Said two strong breakwaters were run out into the Mediterranean to form an entrance-harbour; at Suez another substantial mole was built. The construction of this canal was much facilitated by the existence of three or four valleys or depressions (formerly lakes) which, when the water reached them, became lakes. Immediately south of Port Said the canal crosses Lake Menzaleh (28 miles long), and south of it the canal traverses three other lakes—Ballah, Timsah (5 miles long), and the Bitter Lakes (23 miles long). The highest point or elevation cut through was about 50 feet above sea-level. At first at intervals of 5 or 6 miles 'sidings' were provided to allow vessels to pass one another; but the rapid increase in the number of vessels using the canal made enlargements of the canal and a general deepening imperative, and by 1890 the canal had been deepened to 28 feet and widened between Port Said and the Bitter Lakes to 144 feet, and from these lakes to Port Suez to 213 feet; this permitted navigation by night in the case of vessels provided with search-light, and the average time of transit was reduced from thirty-six hours to about sixteen hours.

The subjoined table shows the enormous growth in the volume of tonnage using the canal since its opening in 1869:

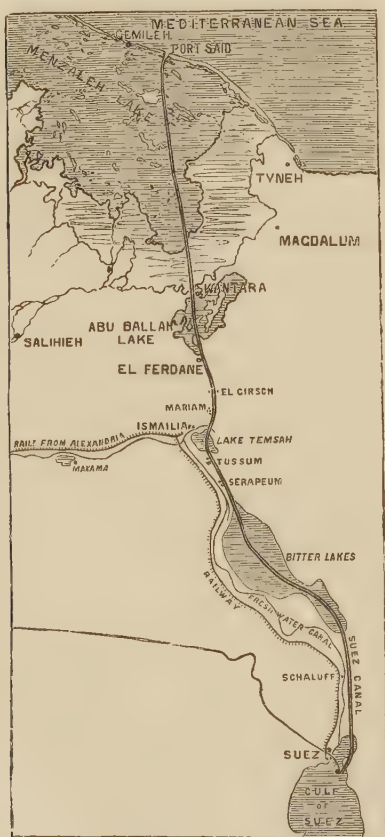


Fig. 1.—Map of Suez Canal.

consideration from as early as the 15th century, but it was not till Napoleon commissioned the engineer Lepère in 1798 to examine and report as to the practicability of the scheme that any definite steps were taken to test the possibility of carrying out such a work. Unfortunately Lepère came to the conclusion, as the result of his survey, that the Mediterranean was about 30 feet lower in level than the Red Sea, and this for the time put an end to the project. Later on Lepère's error was detected. The French diplomat De Lesseps (q.v.) in 1849 began to study the problem, and in 1854 he

Year.	Number of Vessels.	Gross Tonnage.
1870	486	654,915
1880	2026	4,344,519
1890	3389	9,749,129
1901	3699	15,163,233
1914	4802	19,419,495
1920	4009	17,574,657

Both in respect of tonnage and of the number of vessels, Great Britain greatly exceeds all other nations put together. In 1901 2075 of the vessels were British, their aggregate tonnage reaching 8,651,015 tons; in 1920 the British tonnage aggregated 61·7 per cent. of the total which passed through the canal.

In floating the company, besides 100,000 founders' shares 400,000 other shares, each of £20, were issued, making a total capital of £8,000,000. The khedive owned 176,602 of these shares, which were bought by Lord Beaconsfield in 1875 for the British government for £3,976,582, and have proved an extraordinarily valuable and profitable investment. Since the formation of the company, additional obligations up to £8,110,567 have been incurred. All net earnings that remain after 5 per cent. interest has been paid are divided in the following proportions: 71 per cent. to the shareholders, 15 per cent. to the khedive (now the king of Egypt), 10 per cent. to the holders of founders' shares, 2 per cent. to the managing directors, and 2 per cent. to the company's employees. There have been several reductions in the rates charged per registered tonnage of vessels using the canal, the present rate being 8 francs per ton and 5·50 francs per ton for ships in ballast, but the tariff per passenger remains at the original figure.

See De Lesseps, *Lettres, Journal, et Documents pour servir à l'Histoire du Canal de Suez* (5 vols. 1881); D. A. Cameron, *Egypt in the Nineteenth Century* (1898); the annual and other official returns of the company; Lord Milner, *England in Egypt* (6th ed. 1899).

Panamá Canal.—Two rival routes were proposed for the canal to connect the Atlantic and Pacific Oceans across the Central American Isthmus. At

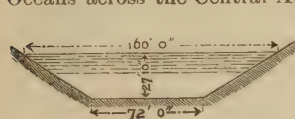


Fig. 2.

Panamá the isthmus is 35 miles in width, and the height of the continental divide about 300 feet; on the Nicaraguan route there is a lower height of the divide—only about 160 feet—but the straight length across the isthmus is about 156 miles. About one-third of this length is covered by Lake Nicaragua, with ample depth, and connected to the Atlantic Ocean by a navigable river.

The completion of the Suez Canal gave a great impetus to the proposals for a Panamá or Nicaraguan canal. De Lesseps was in favour of the Panamá route. In 1878 Lieutenant Wyse obtained for a French association a concession from the Colombian government to construct a canal on the Panamá route. No work, however, was carried out by the holders of this concession. In 1879 an international congress was held at Paris, convened by De Lesseps, and immediately thereafter a French company was organised to purchase the Wyse concession for 10,000,000 francs. After several unsuccessful efforts, in 1888 a financial company was successfully floated, with a capital of 3,000,000,000 francs. This new company, after two years of preliminary survey work, decided on the adoption of a sea-level canal with a depth of 29½ feet. It was estimated that the total volume of excavation would be in the neighbourhood of 157,000,000 cubic feet, and that the cost would be somewhere in the neighbourhood of 658,000,000 francs. The total

length of the canal as projected was to be 47 miles, the route across the isthmus being that followed by the Panamá railway, and De Lesseps estimated that the canal could be constructed in about eight years. The French company carried on work until about the end of 1887, when it became obvious that the original sea-level canal was an impossibility with the funds available, and the scheme was changed to a canal with locks; but gross mismanagement led to the collapse and bankruptcy of the company early in 1889, and the liquidator eventually stopped all work on the canal in May 1889. Eventually in 1894 a new company was organised and floated, and was officially recognised by the Colombian government; but by this time the United States had become alarmed at the prospect of a canal across the isthmus controlled by European financiers and practically under the control of European governments. As far back as 1884 the United States government had taken up the Nicaraguan route as a rival scheme to the Panamá Canal, and in 1889 work was actually begun on this proposed Nicaraguan Canal, and continued until about 1893, when the company owning the concession became bankrupt, and the state of Nicaragua forfeited the concession. In 1899 the United States government appointed an Isthmian Canal Commission. This commission presented a report to Congress in 1900, in which it was stated that, as it seemed impossible to come to any agreement with the French new Panamá Canal Company, they, the commission, expressed the opinion that the United States government should adopt the Nicaraguan Canal scheme. The Panamá Canal Company, now recognising that it was impossible with the finances at their disposal to complete the Panamá Canal, agreed in January 1902 to sell their property and concession to the United States government for 40,000,000 dollars, and on 28th June 1902 a bill was approved by the President of the United States, authorising the purchase on condition that the Colombian government should grant perpetual control to the United States of a strip of land 6 miles wide along the route of the canal. A treaty was signed with Colombia in January 1903; but the Colombian Senate refused to ratify this treaty, and it seemed probable that the United States would be forced to take up the Nicaraguan route. However, in November 1903 the state of Panamá revolted from Colombia, and declared itself an independent republic. Almost at once it granted to the United States perpetual control of a strip of land 10 miles wide along the canal route, and the transference of the French company's rights and property was at once carried through.

Early in 1904 a commission was appointed to carry out the work, Mr J. F. Wallace being chief engineer. Early in 1905 the commission was re-organised, and Mr J. F. Stevens became chief engineer. The question as to whether the canal was to be a sea-level canal or a lock canal had never been definitely settled, and an International Board of Engineers was appointed to advise the United States government on this point. The board by a majority reported strongly in favour of a sea-level canal; the minority reported in favour of a canal which should have a summit-level about 85 feet above sea-level, and the necessary locks, and Mr Stevens, the chief engineer, supported this latter scheme. The report of the board was referred to the Isthmian Canal Commission, and this commission decided to recommend the report of the minority, and the commission's decision was ratified by Congress in June 1906.

Early in 1907 tenders were opened, but it was found that none of these was entirely satisfactory, and President Roosevelt decided that the work should be undertaken by the government, and

should be carried out under the control of the United States Corps of Engineers, Major G. W. Goethals being appointed engineer-in-chief and chairman to the Canal Commission.

The main dimensions of the canal are as follows: Length of canal from shore to shore, $40\frac{1}{2}$ miles; or from deep water on the Atlantic side to deep water on the Pacific side, 50 miles. The summit-level, regulated between 82 and 87 feet above sea-level, extends for a length of $31\frac{1}{2}$ miles from a dam at Gatún to one at Pedro Miguel; a flight of three locks gives access to it at Gatún, and two sets of locks lead from summit-level to the Pacific level at Miraflores. The Gatún dam, $6\frac{3}{4}$ miles from the Colón end, created an artificial lake of about $164\frac{1}{2}$ square miles in area, which forms the reservoir into which the flood-waters of the river Chagres—which had been such an insoluble problem in all the other schemes—pass. The locks are in duplicate, each 110 feet wide, with a maximum available length of 1000 feet; the maximum depth of water over the sill is 40 feet of salt water and $41\frac{1}{2}$ of fresh water.

The mean sea-level is the same at Panamá and Colón, but the rise and fall of tide at Colón is only $2\frac{1}{2}$ feet, and at Panamá 21 feet.

Beginning at Colón, the first $6\frac{3}{4}$ miles of the canal are a channel 500 feet wide and 41 feet deep, mostly dredged out. Then the locks in the Gatún dam give access to the artificial lake. This lake forms the summit-level, which extends from mileage $6\frac{3}{4}$ at the Gatún lock to mileage 39 at the Pedro Miguel lock. The width of the channel for about 16 miles is 1000 feet; thereafter it is gradually decreased, till in the famous Culebra cut, which carries the canal through the continental divide, the width becomes only 300 feet. The minimum depth is 41 feet.

The Pedro Miguel lock is a single lock, by which ships are lowered from the 85 feet level of the Gatún lock to the 55 feet level of the Miraflores Lake. On each side of this lock are dams extending to the adjoining hillsides, in order to prevent the impounded waters of Gatún Lake flowing off towards the Pacific.

From mileage 39 to mileage 41 the canal is formed by another artificial lake, Miraflores, formed by impounding the waters of three rivers which drain into the Pacific.

At Miraflores there are two twin locks, with dams on each side to form the Lake Miraflores. The double locks have a total drop of $54\frac{3}{4}$ feet. The channel through Miraflores Lake is 500 feet wide, and from the Pacific side of the locks the channel is maintained at a uniform width of 500 feet.

All curves are of as large a radius as possible, and the channel is widened at all curves so as to allow vessels to take the curve easily and to render unnecessary any checking of speed; in fact, a ship can steam the whole 50 miles at full speed with the exception of the 9 miles which comprise the Culebra cut.

The total excavation was estimated to be about 182,000,000 cubic yards. The total earthwork excavated under the French scheme was about 78,000,000, of which rather less than half was adapted to the present scheme.

Owing to the constant slips in the Culebra cut and silting brought about by the Chagres River the total excavation probably exceeded 200,000,000 cubic yards. Neglecting any effect of side-slips, the Culebra cutting would have required about 90,000,000 cubic yards of excavation. These figures will give some idea of the magnitude of this particular portion of the work. The slipping occurred in two ways—the soft material slipped forward on the inclined surface of the harder material below,

or the soft matter underneath was squeezed up by the weight of the sides.

Of the five dams directly connected with the canal the Gatún is by far the most important, and presented the greatest difficulties in construction. Its length is 7500 feet, its greatest height 115 feet above sea-level, the greatest width at the bottom 2100 feet, and the width at the top 100 feet, the cubical contents of the dam being 21,000,000 cubic yards.

The maximum flood discharge of the Chagres River at a point near to the $30\frac{1}{2}$ -mile peg on the canal was 170,000 cubic feet per second, which caused the river to rise 40 feet in level in twenty-four hours.

The dam is made in three parts—two outside portions, and an inner core of material of a silty character, pumped up from the bed of the river, called 'the hydraulic fill.' The outside portions were tipped from the rock, and other material brought from the Culebra cut.

The spill-way in connection with the dam was arranged to have a discharge capacity of 154,000,000 cubic feet per second, and it leads into the old bed of the Chagres River below the dam. The depth of water in the lake is 47 feet, which is 5 feet more than is absolutely required. The power required to work the sluice-gates in connection with the spill-way and all the lock machinery is generated at the spill-way by turbines.

The labour force at its maximum amounted to 35,000—5000 skilled labourers and artisans from the United States, 4500 Spaniards and Italians, and about 25,000 West Indians—the United States government providing practically the whole of the food and clothing of this great force of labour.

The sanitary arrangements were carried out on a marvellous scale, over two years being spent on the sanitary work, drainage, and preparation of quarters, and strict quarantine was enforced. All quarters and offices belonging to the Canal Commission were protected by copper gauze wire-netting. All rain-water was drained off, and all stagnant pools practically closed. Wherever possible swamps were filled up, and all drains were kept clear of weeds by being sprayed regularly with weed-killing disinfectant, and all pools which could not be drained were sprayed with kerosene at regular intervals. The wire-netting on the houses added greatly to the comfort of the occupants.

The canal was completed and unofficially opened on 15th August 1914. The first vessel to make the trip was the United States War Department steamer *Ancon*, on board of which was a number of officials and guests, including the President of the Republic of Panamá.

See a paper by Colonel G. W. Goethals, read before the British Association at Winnipeg in 1909, published in *Engineering*, vol. lxxxix. p. 171. A complete account of the canal has been published in a series of articles in *Engineering*, vols. xcv.-xcviii.

Isthmus of Corinth Canal.—Work in connection with the provision of a ship-canal across this isthmus was begun by the Emperor Nero; traces of this work still remain. The present canal was begun in 1882. It is 4 miles long; the central portion cut through rock is a cutting 285 feet in depth; the section at this point is shown in figure. The canal has no locks, the bottom width is 72 feet, and the depth $26\frac{1}{2}$ feet, the original dimensions of the Suez Canal. At each end the approaches are protected by solid jetties built out into the sea. This canal, which shortens considerably the distance between certain of the Mediterranean ports and the Black

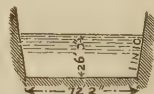


Fig. 3.

Sea, was completed in 1893, and cost between one and two millions sterling.

Kiel Canal.—The original Holstein Canal, about 26 miles in length, opened in 1785, connected the river Eider, which flows into the North Sea, with Kiel on the Baltic shores, and enabled vessels of 120 tons to pass direct to the Baltic from the North Sea, thus avoiding the circuitous and difficult voyage round Jutland; it was only 51½ feet wide and 9½ feet deep. In 1887 works were begun for a real ship-canal from Brunsbüttel, at the mouth of the Elbe, to Holtenau and Kiel, capable of allowing the passage of the largest sea-going steamers. It was to be 28 feet deep, 198 feet wide at the surface, and 72 feet wide at the bottom. It was partly opened in 1891, and completed in 1895. At the Kiel end there is a big lock. The estimated cost was £8,000,000. As the sea-voyage from the Elbe round Jutland was about 600 miles in length, and was, in addition, a piece of dangerous navigation, the commercial and naval importance of this canal to Germany was immense. The rapid increase in the size of modern battleships compelled Germany, if it was to derive full strategic value from this canal, to begin in 1908 the work of greatly enlarging its cross-sectional dimensions; the depth was increased to 36 feet, and the bottom width to 144 feet. The work was not completed when war broke out in 1914, but was finished during the early years of the war, the total cost being about £11,000,000, and the canal played a very important part in German naval strategy during the great naval struggle between 1914 and 1918.

Amsterdam Ship-canal.—This canal, which connects Amsterdam with the North Sea, thus severing the peninsula of North Holland, provided a more direct outlet for the trade of Amsterdam to the ocean than was possible by the shallow Zuider Zee and the North Holland Canal. The canal passes through Lake Y and Wyker Meer, and therefore



Fig. 4.

only a narrow neck of dry land, 3 miles in width, between Velsen and the North Sea, had to be excavated. Part of the cost of the work was met by reclamation of land in the two lakes, made possible by the banks formed by the material dredged up in the excavation of the canal proper through the lakes (see fig. 4). The canal is 16½ miles long, is wider (see fig. 5) at the base, and

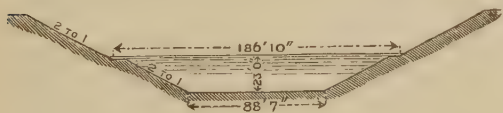


Fig. 5.

only 3 feet shallower, than the original Suez Canal section. Locks near each end of the canal, with gates pointing both ways, afford perfect control over the water-level of the canal, which is maintained at 14 inches above low-water level in the North Sea, in order to maintain the drainage of the low-lying adjacent lands and the reclaimed lake areas. Drainage water, which passes into the canal from branch canals, and is pumped into it

from the reclaimed land, is pumped up from the canal into the Zuider Zee by pumping plant placed near the locks in the dam which shuts off this Zee from the canal and reclaimed lands. The North Sea entrance is protected by two converging concrete breakwaters. The work was begun in 1865, and completed in 1876 at a cost of about £2,600,000.

Manchester Ship-canal.—This canal, which was at the first inception of the scheme violently opposed by Liverpool and the railway interests, was sanctioned by parliament in 1885. The canal begins in deep water at Eastham, on the left bank of the Mersey, opposite to Garston; it then skirts the shore of the Mersey estuary up to Runcorn, where it cuts into the land, and, following approximately the course of the Irwell, finishes in Manchester at Trafford Bridge. At its terminus, docks with a water-surface of 105 acres have been provided. The canal is 35½ miles long, the minimum depth is 26 feet, and the minimum bottom width is 120 feet (see fig. 6); in good ground the side-slopes are 1 to 1, well

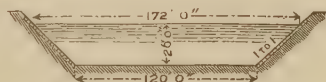


Fig. 6.

pitched with stones. At Eastham are tidal locks, with their sills 20 feet below low-water, so that vessels are able to enter and leave the canal at about half-tide; the lift of these locks is 16½ feet. The canal is divided by locks into four reaches of lengths 21, 7½, 2½, and 3 miles respectively, the locks being situated at Latchford, Irlam, and Barton, with lifts of 16½ feet, 14 feet, and 14 feet respectively. There are three sets of locks at each of these places, 550 feet long by 60 feet wide, 300 feet by 40 feet, and 100 feet by 20 feet, the two larger locks having intermediate gates. This plan enables a great variety of vessels to be dealt with, and economises losses of water by lockage. The passage of the canal takes about seven hours, allowing about twenty-five minutes for passing each lock. The famous Bridgewater Canal crosses the canal by a swing aqueduct, so as to allow masted vessels to pass along the ship-canal, and a hydraulic lift affords communication between the two waterways. The total cost of the canal was about £15,500,000, and the traffic along it has grown steadily year by year since its completion.

Other interesting ship-canal for converting inland towns into seaports are the Bruges Canal to Zeebrugge; the Ghent-Terneuzen Canal—this latter connecting Ghent by a route only 21 miles long with Terneuzen, on the Scheldt; and the Petrograd and Cronstadt Canal, made necessary by the bar at the mouth of the Neva and the want of depth in the Gulf of Finland. This canal starts from the Neva in Petrograd. It is 22 feet deep, and has at the start a bottom width of 207 feet, gradually enlarged to 275 feet. It cost about 1½ millions sterling.

Numerous other important ship-canal in various parts of the world have been proposed, but so far none of these have been pushed beyond the proposal stage, such, for example, as the Forth and Clyde Canal.

The question of the sanitary condition of canal-boats, their registration, &c., are dealt with in the Canal Acts of 1877 and 1884.

Canandaigua, the capital of Ontario county, New York, at the north end of Lake Canandaigua, 28 miles SE. of Rochester by rail; pop. 7000.

Canara. See KANARA.

Canarium, an oriental genus of Burseraceæ, yielding gums, oils, &c. *C. commune* is a native of the Moluccas, but introduced into many parts of tropical Asia. It is a tree about 50 feet high; its fruit is a drupe, of which the kernel is eaten raw, roasted, or made into bread. The tree also yields a resin. *C. strictum* yields black dammar (see DAMMAR). Elemi (q.v.) and Pili nuts (rich in fat and used for dessert and confectionery purposes) are got from the Philippine tree, *C. luzonicum*, and other species.

Canary Bird (*Serinus Canaria*), one of the finch family (Fringillidæ), akin to the goldfinches and the linnets. It is found in Madeira, the Canary and Cape Verde Isles; frequents the neighbourhood of human habitations; builds its nest of moss, feathers, hair, &c. in thick, bushy, high shrubs or trees; and produces from two to four broods in a season. In its wild state its plumage is olive-green or greenish-yellow tinged with brown, and the yellow cage-birds have been produced by selective breeding in domestication. It was brought to Europe in the beginning of the 16th century. It breeds readily in confinement, seems thoroughly reconciled to its cage-life, and if handled when young becomes very tame and fearless. In confinement the canary often breeds three or four times a year, laying from four to six eggs each time. The eggs are pale blue. The male assists the female in building the nest and in feeding the young. Besides canary and millet seed, which are their principal food, canaries are very fond of flowering groundsel and chickweed, a very small supply of which is necessary for their health; and one of their favourite luxuries is sugar. The canary not infrequently lives 15 or 16 years. It can be taught various notes and airs, and even learn to articulate words. The rearing and training



Norwich Canary.

of canaries afford occupation to no small number of persons, particularly in Tyrol. The canary hybridises readily with some other species of finch, producing 'mules,' some kinds of which are valued as song-birds. There are several species very closely allied to the canary, one of which, the Saffron Finch, a beautiful little bird, a native of Brazil, is sometimes sold in Britain as a song-bird, but its musical powers are very inferior to the canary's.

Distinct varieties have been produced by scientific selective breeding, and these reproduce their distinctive characteristics, and 'like breeds like' so long as the varieties are not crossed. The hardest

are the Norwich; the largest are Lancashire Copsies; the most costly and delicate are Belgians; others are Lizards, London Fancies, Yorkshires, Scotch Fancies, and Cinnamons. By giving sponge-cake and cayenne pepper mixed, instead of seed, at the period of moult the plumage is artificially coloured, becoming very brilliant; and canaries apparently relish this fiery diet and thrive upon it. See CAGE-BIRDS.

Canary Creeper. See TROPÆOLUM.

Canary Grass (*Phalaris canariensis*), a grass of which the seed is much used, under the name of *canary-seed*, as food for cage-birds, and which is on that account largely grown in southern California, and to some extent in the south of Europe, and in certain districts of Germany and England. It has become naturalised in many parts of northern Europe, including Britain, but is a native of southern Europe and the Canaries, where it sometimes furnishes a wholesome and palatable addition to or substitute for wheaten flour. The large Reed Canary Grass (*P. arundinacea*), common on river-banks, is an abundant source of coarse fodder. A striped variegated variety is



Canary Grass (*Phalaris canariensis*).

cultivated as 'gardeners' garters,' 'ribbon grass,' or 'ladies' traces.'

Canary Islands, a group of islands belonging to Spain in the Atlantic Ocean, off the NW. coast of Africa, in 27° 40'–29° 25' N. lat., and 13° 25'–18° 16' W. long., forming a Spanish province. The group consists of seven large and several small islands, with a joint area of about 2800 sq. m., and a population of 473,500. The principal islands, proceeding from east to west, are Lanzarote, Fuerteventura, Gran Canaria, Tenerife, Gomera, Palma, and Hierro or Ferro. The distance from Fuerteventura to the African coast is about 62½ geographical miles. The coasts are steep and rocky, and the surface is diversified with high mountains, narrow gorges, and deep valleys. All the islands are volcanic, and everywhere show plain marks of their origin, in the shape of cones, craters, beds of tuff and pumice, and streams of lava; but eruptions have taken place within the historical period only in Tenerife, Palma, and Lanzarote. There are no rivers, and on several of the islands water is very scarce. The springs on those better supplied are diverted by long artificial channels for the purpose of irrigation.

Of a thousand species of wild flowering plants found on these islands about half are peculiar to the

group. Above the region of cultivated plants in Tenerife and Grand Canary are found laurels and other evergreen trees. Higher still are forests of the handsome *Pinus canariensis*, and large tracts are covered with arborescent heaths and brooms of many species. Looking at the flora as a whole, it is seen to be mainly of a South European character, with a large infusion of genera allied to African types. As to the cultivated plants, the warmth of the lowest region allows of the growth of the sugar-cane, sweet potato, banana, date-palm, and other natives of hot climates; whilst above, to the height of about 3000 feet, the vine and various cereals are cultivated in a climate resembling that of the south of Europe.

Minerals are few and of little importance. The temperature near the sea is genial. Taking Puerto Orotava, on the north coast of Tenerife, as an example, the annual mean is about 69.5° F.; the mean of January and February, the two coldest months, is 62.25°; the mean of August, the hottest month, is 77.2°; the daily range during the colder months is from 10° to 17°. The mean annual fall of rain amounts to about 14 inches, and the mean number of days on which rain falls during the year is 52. Rain falls irregularly on the coast from November to April; for the rest of the year the cultivators of the soil rely upon artificial irrigation. The north-east trade-winds prevail from April to October; at other times south-west winds are prevalent. Occasionally the islands are visited by hot east and south-east winds from Africa, which bring dust and are otherwise disagreeable. In consequence of the higher temperature, the less rainfall, and drier atmosphere compared with Madeira, and of the much increased facilities for reaching the islands, Orotava and Las Palmas have come into note as winter-resorts for invalids.

Cochineal, once the staple production, has fallen into neglect, owing to the competition of aniline dyes. The cultivation of the vine (almost ruined after 1853 by the grape disease—see VINE) has extended, as has that of sugar-cane; wine being exported to the European continent, and sugar to Spain. Tobacco is also grown. Excellent roads have been formed; the ports of Santa Cruz and Las Palmas have been improved.

TENERIFE, the largest island of the group, has an area of 877 miles, with a population of 184,000. The chief town and port is Santa Cruz de Santiago (q.v.), on the south-east coast. It is the seat of the officials of the general government. The other towns are Laguna, a few miles from Santa Cruz, on a plain 1800 feet above the sea; Puerto Orotava, on the north coast; Villa Orotava, 1060 feet higher; and Icod de los Vinos, near which the largest existing dragon-tree grows. The famous Peak of Tenerife (q.v.) is in the south-west of the island.

GRAN CANARIA, which is next in importance, has an area of 758 sq. m., with a population of 164,000. Its culminating peak is El Cumbre, with a height of 6648 feet. The capital, Las Palmas (q.v.), on the east coast, is the largest town of the archipelago. The surface of this island is so broken that only a small part is under cultivation. At Artinara, at a height of 3350 feet, there is a village of caves. A few miles from Las Palmas is the cone of Vandama, 1800 feet high, with an extinct crater, circular and perfect, 800 feet deep.

PALMA, a classic spot for geologists, has an area of 718 sq. m., and a population of 50,000. Its highest peak, Pico de los Muchachos, has an elevation of more than 7600 feet. The ancient crater of the Caldera is of enormous size, though open to the sea on one side. The capital is Santa Cruz de las Palmas (q.v.), on the east coast.

The area and population of the other islands are as follows: LANZAROTE is 323 sq. m., pop. 21,000;

FUERTEVENTURA, 326 sq. m., pop. 13,000; GOMERA, 169 sq. m., pop. 15,000; HIERRO, 82 sq. m., pop. 6500. In former times the first meridian of longitude was commonly drawn through Hierro. The chief towns of these islands are small.

The Canaries are by some supposed to have been the Fortunate Islands of the ancients. The geographers of Greece and Rome were acquainted with their position, and King Juba's account of them has been preserved by the elder Pliny. For many centuries they were lost sight of, and not rediscovered until 1334, when a French vessel was driven amongst them by a storm. In 1402 the Norman Jean de Bethencourt fitted out an expedition for the purpose of subduing the islands, and in 1404, having obtained assistance from Spain, he succeeded in mastering four of them. His successor having sold his rights in Spain, they were afterwards acquired by the king, who sent a large force in 1477 to conquer the Guanches, a race of large stature, and comparatively fair, at that time in a neolithic stage of civilisation. The last of the islands was not mastered till 1495. They have been ever since the property of Spain. The Guanches suffered terribly from their conquerors, and have long ceased to exist as a separate people; but in the local museums may be seen specimens of their mummies, skeletons, weapons, and pottery works. They were a composite people, made up of three or more stocks: a Cro-Magnon type, a Hamitic or Berber type, and a brachycephalic type.

See books by Pegot-Ogier (Eng. trans. 1882); Olivia Stone (1888); C. Edwards (1889); J. Whitford (1890); J. H. T. Ellerbeck (1892); A. S. Brown (1901); Alonso de Espinosa, *The Guanches of Tenerife* (trans. Markham, Hakluyt Soc., 1907); D. A. Bannerman, *The Canary Islands, their History, Natural History, and Scenery* (1922).

Canary Plant. See TROPEOLUM.

Canary Wine, also known as TENERIFE, is the produce of the Canary Islands, and is a dry white wine resembling Madeira, but with less body and perfume. The name *Canary* was formerly applied generally to dry white wines, which were frequently seasoned with sugar, cinnamon, nutmeg, roasted apples, and eggs.

Canberra, destined Federal capital of the Commonwealth of Australia, was till 1910 an unimportant hamlet 226 miles south-west of Sydney by rail and road. The site was fixed by act of parliament in 1908 as in the 'Yass-Canberra' district, and was later on defined as an area of about 12 sq. m. near Queanbeyan, in the northern part of the Federal Territory—an area of 900 sq. m. along the Upper Murrumbidgee, to which has been added a patch of coast-land 120 miles away, stretching from the southern shores of Jervis Bay to St George's Basin. The Federal Military College is situated in the Territory proper, and the Naval College is in the coastal annex. The foundation of the 'commencement column' in front of the Capitol, on the highest eminence of the site, was laid with suitable ceremony on 12th March 1913. Pop. of Federal Territory, 2600.

Cancale, a bathing-place in the French department of Ille-et-Vilaine, 8 miles ENE. of St Malo, on the bay of the same name, famous for its oysters; pop., with the port of La Houle, 7000.

Cancan is an ungraceful dance, something of the nature of a quadrille, but accompanied by violent leaps and indecorous contortions of the body, practised in French dancing-saloons. The earlier and usual meaning of the word is noise, racket, scandal.

Cancellaria, or LATTICE-SHELL, a large genus of Gasteropods in the order Prosobranchiata, not far removed from the cone-shells. The shell is usually buckie or whelk-like, but the transverse

lines are crossed by longitudinal bars, which produce a pretty lattice-like pattern.

Cancelling of Deeds and Wills. The word cancel comes from the Lat. *cancelli* ('lattice-work'), and a deed was formerly said to be cancelled when lines were drawn over it in the form of lattice-work. The word cancel is now used to signify any act of obliteration, destruction, or revocation showing a deliberate intention on the part of the granter of a document to render the document inoperative, in whole or in part. Thus a will may be cancelled by the testator executing another will or codicil inconsistent with, or expressly revoking, the former; or by the original will being burned or torn up or otherwise destroyed by the testator, or by some one in his presence and acting on his directions, with the intention on the part of the testator that it should be revoked. The destruction or mutilation of a will by some accident, or by the testator while insane, or by any person acting without the authority of the testator will not operate cancellation. But when a will has been executed in duplicate, the destruction or tearing up of one of the parts by the testator is effectual if proved to have been done by him with the intention of revoking the will. Obliterations, interlineations, or other alterations in a will are not effectual to cancel or alter the testamentary dispositions, however clear the intention may be to do so, unless they are properly identified by the signature of the testator and two witnesses; even if the testator draws his pen through his own signature and those of the attesting witnesses, this is not a cancellation of the will. Where, however, the obliteration is such as to prevent the words originally written from being 'apparent'—i.e. such as that they cannot be read—the words so obliterated are cancelled. So if the signature is cut out or completely obliterated the will is cancelled. A material alteration, or erasure of words, in a deed or any contract in writing, if made intentionally by one of the parties thereto, without the consent of the other, prevents the former enforcing the deed or contract against the latter. In the absence of evidence, alterations in deeds are presumed to have been made *before* execution, and those in wills *after* execution. In a Scottish deed or will, probative in form and not holograph, cancellations by way of deletion or erasure must, in order to receive effect, as a rule be enumerated in the testing clause or otherwise be properly authenticated. In a bill of exchange an erasure or other alteration that is 'not apparent' does not render the bill void in the hands of a holder in due course. He can enforce the bill as originally written (Bills of Exchange Act, section 64). But it has been held that this provision does not apply to Bank of England notes.

Cancer, the *Crab*, the fourth of the twelve constellations and signs of the zodiac. See ZODIAC; also ECLIPTIC, PRECESSION; and for the TROPIC OF CANCER, see TROPICS.

Cancer (Lat. *cancer*, 'a crab'; Gr. *karkinos*). The reason for the application of this term to the most important group of the tumours is shrouded in mediæval obscurity. It has been supposed that it was employed because of some fancied resemblance of the tumour to the body and limbs of a crab, when from the central tumour dilated veins extend into the surrounding tissues, and it has been suggested that the gradual eating away of tissue by ulceration gave rise to this curious name. Since a crab has a hard shell, it owes its Greek and Latin names to this fact; and the term cancer, as applied to disease, may have originally meant nothing more than a hard lump on the surface of the body, for internal cancer was hardly known before post-mortem examinations began to be per-

formed towards the middle of the 19th century. The term is now in general use as covering all sorts of 'malignant new growths' or 'tumours' as distinct from other tumours of an innocent, inflammatory, or hypertrophic nature. Cancer is limited scientifically to the 'carcinomata,' which are malignant new growths of epithelial origin—i.e. arising on the surface of the body, in the lining of the alimentary canal, and in the lining of glands generally. Such growths arising in covering or secreting epithelium are distinguished from the 'sarcomata,' which arise in the supporting connective tissues, the bones, in cartilage, and in lymphatic glands.

Distribution.—While it was formerly supposed that cancer was a disease of civilised man only, the investigations of the Imperial Cancer Research Fund have shown that no race of mankind is exempt. It is very common in Japan and in India. Strictly vegetarian and other castes are equally liable. It occurs throughout the aboriginal inhabitants of Africa. There are no data which permit of reliable comparisons between each European country and another, and there is no means whatever of determining the relative liability of aboriginal races, since all data of population and of the relative proportions of the two sexes at the several age-periods are wanting. The investigations of the Imperial Cancer Research Fund have also shown that all vertebrates are liable to cancer even when living in a state of nature. The disease presents the same essential features throughout the vertebrates if regard be paid to differences in anatomical structure.

Relation to Age and Sex.—Cancer has a remarkable relation to age. Below thirty-five it is a rare disease, but it becomes a very important cause of death in the meridian and post-meridian periods of life, the liability increasing as age advances. The age at which the several organs are most liable varies from one to another, but is the same for the same organs in the two sexes. This relation to age also holds for all vertebrate animals whether life be long or short; it appears to be bound up with the origin of the disease. Women are more liable to cancer than men, but this is solely because of the frequency of cancer of the womb and breasts, organs which can be left out of account in the male sex. If the figures for these organs are deducted for females, then males show a higher rate.

Relative Frequency in Different Parts of the Body.—Cancer of the stomach and of the liver (the latter is probably secondary to cancer elsewhere—e.g. of the stomach, intestines, rectum, pancreas) causes most deaths at each age-period after thirty-five. Cancer of the rectum takes third place except at the latest age-period, when cancer of the face (largely rodent ulcer) causes more deaths. Amongst women the uterus is the commonest site of the disease up to sixty-five, the stomach from sixty-five to seventy-five, and the breast after seventy-five. The breast comes second up to sixty-five, but only fourth from sixty-five to seventy-five. Apart from the reproductive system, the stomach and liver come first as in man. For the alimentary canal the figures of relative liability of the two sexes cross at the stomach, so that in males there is more cancer above the stomach, and in females more below it. This peculiarity has been brought into relation with the habits of the two sexes whereby the male irritates the upper half of the canal by smoking, drinking, and excesses in eating, and the female suffers more from the chronic irritation associated with constipation.

Apparent Increase.—The real or apparent increase of cancer has long been the subject of discussion. When all cases of cancer are thrown together, there is a remarkable increase in the total number

of cases recorded during the past sixty years in all countries where any statistics are available. The increase is also evident when the figures are stated in terms of a million persons or of each sex living at each age-period. The increase affects mainly the higher age-periods and the parts of the body less easily accessible to complete examination. These facts have suggested that more careful certification of the causes of death and improvements in diagnosis are largely responsible for the apparent increase. An apparent increase is also observable for the tongue and breast, which can hardly be fully accounted for in this way. Little or no increase has been recorded for the liver, ovary, uterus, skin. The greatest increase has affected the stomach and intestines, obviously because deaths formerly attributed to cancer of the liver are now allocated to the correct site of origin with greater frequency. The question of the real or apparent increase of cancer is a complex statistical problem of which the solution is by no means finally settled. It seems, however, certain that it is wrong to speak of an increase of cancer as a whole; the increase, be it real or only apparent, affects different parts of the body unequally, and for some parts it has not taken place at all.

Nature.—Cancer manifests itself by the appearance of a lump, and later an ulcer due to a continuous new growth of cells. The change begins in a limited area, and in the natural course of the disease the growing cells spread throughout the body until death ensues. The nature of the change in the cell growth from healthy to cancerous is still unknown, although certain conditions—e.g. aging and chronic irritation of the tissues—are in some way associated with its origin. It is, however, definitely established that the cancerous change is at first purely local; but if the disease be allowed to run its normal course, the offspring of the original cancer cells spread throughout the body.

The exact knowledge of to-day has rejected the old surmise that cancer pervaded the system as a whole before it broke out at any particular spot. Cancer is not an outgrowth or outcrop from deep-seated 'roots,' but consists of a circumscribed mass of cells of epithelial origin from which offshoots may ultimately spread throughout the body. A carcinoma may begin in a little group of cells in the skin, the mucous membrane of the stomach or intestine, in the breast—in short, in any gland or on any surface covered by epithelium. A sarcoma arises in the same way in any of the connective tissues, fat, bone, bone-marrow, periosteum, lymph glands. Cells which have undergone the cancerous change cease to serve any useful purpose in the body. They multiply not to replace others that have been used up, but wantonly or purposelessly, and often with astonishing rapidity. They become dangerous to the body as a whole by invading the surrounding tissues, which they grow into, or before doing so push aside. Thus, according to their situation, they destroy bone, cartilage, the eyes, the ears; they press upon the windpipe or gullet, causing difficulty in breathing or actual starvation; they destroy the walls of blood-vessels and lead to exhausting bleedings. Important glands like the liver, pancreas, or thyroid may have their functions gravely disturbed. Digestion in the stomach and intestines may be seriously interfered with. These are all the consequences of the action of the growing cancer cells on their immediate surroundings; but there are also remote consequences owing to cells being freed from the mother tumour, and after being transported by the blood or lymph streams, establishing themselves in distant parts of the body, there to repeat their pernicious local consequences—in the lungs, the liver, the bones, the brain, the

lymph glands, &c. These secondary colonies or metastases reproduce more or less perfectly the structure of the original growth, so that under the microscope a piece of rectum appears to be growing in the liver, or a piece of liver growing in the lung. The earlier and the more numerous such secondary growths develop the sooner comes the end, which may or may not be preceded by marked wasting or 'cachexia.' Although there are differences of opinion regarding the nature of cancerous cachexia, the weight of evidence favours the view that it is a consequence of the advance of the disease and not an antecedent constitutional condition. Cachexia is most marked where there is interference with the food-supply through difficulty of swallowing, obstruction or ulceration of the intestinal canal. Where large ulcerating surfaces develop either on the surface of the body or in the alimentary canal, the plight of the patient is rendered worse by the absorption of septic products. Fortunately the course of events is not uniformly so bad. The end may come long before the final stages of wasting would lead to death from exhaustion. A sudden hæmorrhage due to the erosion of a large blood-vessel or an embolus carried to the brain, the heart, or lungs may bring about a sudden and painless end even in the worst cases. Moreover, cancers are not all equally malignant in their course. There are slowly growing and rapidly growing forms. From the time of first observation life may last for a few months or for many years, and in the latter case often with little more than discomfort. Practically any tissue of the body (except the nerve cells of the brain) may give rise to cancer, and under the microscope the tissue of origin is mimicked more or less closely. The more closely this structure is reproduced the less dangerous as a rule is the cancer. There are all stages in structure: at the one end what are known as soft cancers have lost all structure, and as a rule they grow very rapidly; at the other end there are all stages of retention of structure up to tumours which show little or no departure from the normal. Such are usually called benign or innocent growths, but no sharp line can be drawn between the benign and the malignant tumours under the microscope. There are many anomalies. Some cancers produce a large amount of connective tissue reaction. They are then very hard, as in the well-known and frequent 'scirrhous' of the breast, which notwithstanding its hardness is one of the worst forms of the disease. Tumours of the thyroid gland may show no departure from the normal structure, yet disseminate widely, especially in the bones, particularly those of the skull. An apparently innocent tumour may grow slowly and without danger for years, and then for some unknown reason suddenly begin to grow rapidly and fatally. The most dangerous forms of cancer occur when a rapidly growing tumour develops in a young, robust individual. As a general rule cancer, which is more frequent in the higher age-periods, is less dangerous than in more youthful individuals.

Cause.—The cause of cancer is unknown. For a time it was supposed to be a parasitic or infective disease. No evidence able to withstand scientific criticism has been advanced during the thirty years that this view has been put forward by reputable and even distinguished authorities, but it is only certain that cancer has no analogy with any known form of infective disease. Age, by bringing with it senescence of the tissues, is in some way bound up with causation, but how is unknown. Heredity has long been supposed to have some importance in man, and breeding experiments with mice have shown that there is some justification for this view, although not to an extent to create alarm, since the very high concentration of the hereditary factor, experimentally possible in mice, is not likely to occur

often, if at all, in a human population. Chronic irritation is apparently of great moment, especially for some parts of the body. The investigations of the Imperial Cancer Research Fund have raised to the level of unintentional experiments on the production of cancer certain peculiar practices of native races who are especially liable to cancer of certain parts of the body from which the disease is absent in other races. Similar accidental experiments have been made on animals, and there are indications that cancer may even be deliberately induced in them by irritation experimentally applied. These observations have directed renewed attention to the association of cancer with all forms of chronic irritation, which may be mechanical, actinic, chemical, or animate, as the tubercle bacillus in an old lupus scar, bilharzia in the cancer of the bladder so common in Egypt, &c. The irritants have nothing in common, so that the search has been directed to the properties of the cancer cell itself. The great variability of these cells under experimental conditions has recently attracted attention, and is being widely studied with a view to explaining the association of cancer with chronic irritation.

Diagnosis.—The signs attending the early development of cancer are so insignificant that they do not attract the attention of the patient himself, and are often not observed even by the skilled practitioner. The first symptom to attract attention may be ulceration or pain where an antecedent lump had attracted no notice. It may be that intractable indigestion has been neglected till loss of flesh and an unhealthy appearance urge the patient to seek medical advice. In other cases, notably when the uterus is involved, repeated or irregular bleeding may be the first sign to awaken alarm.

Added to the difficulty arising from the insidious onset of the disease is the further one that cancer has no specific symptomatology. The signs or symptoms attending the early development of cancer are very variable even for the same part of the body. If it be on the surface of the body, an abnormality is more likely to attract early attention than if an internal organ be affected. A small ulcer or lump on the surface of the tongue will soon attract attention from the pain and inconvenience it immediately causes, but such conditions in the stomach will remain unnoted till a secondary disturbance of function calls for a careful examination. Pain is very emphatically associated with some forms of cancer affecting particular parts, but it cannot be too strongly urged that cancer in its beginnings is always painless, and it may long run its course, and even terminate fatally, without any pain whatsoever. Pain, therefore, should never be waited for; and since a lump or ulcer is the most obvious sign of a cancer, a warning must be entered against assuming all lumps and ulcers to be cancer. The great majority will be found to be nothing of the kind, but only the skilled adviser can advise as to whether mere inflammation, hypertrophy, a harmless cyst, or a benign tumour is present. The examination of all conditions simulating cancer outwardly, or actually cancerous, can only be conducted by members of the medical profession possessed of the highest anatomical and physiological knowledge, as well as of wide experience and skill, since it is necessarily by a process of exclusion that the diagnosis is arrived at. Such knowledge of the natural structure, and of the departures from it, combined with knowledge also of the natural function and morbid processes occurring in the sites liable to cancer, is commonly and most likely to be found in surgeons of eminence, and in well-educated physicians whose skill and personal characters place them above suspicion. Delay in seeking such advice through fear of learning the truth may result in the disease advancing beyond all remedy.

Morbid fears of cancer may be at once dispelled by the skilled medical attendant, who is able to weigh up and sift the very complex elements which enter into the process of diagnosing what is the nature of the tumour which has attracted the patient's notice.

Having regard to the fact that cancer is not preceded by any definite warning signs, and also to the knowledge that it develops in a circumscribed area, diagnosis must depend upon an examination of that area. Naturally, if the lump or ulcer is on the surface of the body examination is easier than when it is internal, but diagnosis is uncertain without the removal of the growth for microscopical examination by a skilled pathologist, who should have all the information elicited by the surgeon placed at his disposal. An exploratory operation may be performed in order to ascertain the nature of an internal growth before its removal is decided on. A small piece of growth may be cut out in order to determine whether or not a more extensive operation should be performed, and then precautions are taken against the risk of spreading the disease by sowing the cancer cells in the wound, and against the chance that a piece removed haphazard may give no true idea of the structure of other parts. A skilled diagnostician will not recommend an operation at all unless he is convinced that it is in the best interests of the patient.

Treatment.—The earliest possible diagnosis of the disease is essential to its successful surgical removal, for it is only in the early stages of the disease that there is any hope of a cure, and unfortunately the majority of patients seek surgical aid when these stages have passed. Recurrence then is frequent. Even if the lymphatic glands are involved by dissemination, great relief may be obtained, although the hope of cure is greatly diminished. If dissemination has extended to the internal organs—e.g. the lungs and liver—nothing can be done to remove the harm in these regions, and surgical treatment of the original growth has for its sole objects the diminution of suffering and offensive discharge.

The only known cure for cancer is the complete removal of the diseased area by means of the knife before the growth has had an opportunity of spreading throughout the body, and the smaller the growth is and the earlier the case is operated on, the earlier and more certain of success the operation becomes. Early operation is more readily possible in cases of cancer on the surface of the body.

Some very small and superficial growths of the skin may be cured by destruction with caustics such as arsenical or zinc paste, strong acids, X-rays, or radium; but these measures cannot be applied to internal growths or employed with success where a superficial growth has attained large proportions. The surgical treatment of cancer is of ancient origin, but as practised to-day it must not be confounded with the crude methods of the past. Anaesthetics and antiseptics have revolutionised surgery, and have enabled the surgeon to look for and to remove cancer in all organs of the body, not even excepting the brain and spinal cord. Naturally, the more obscure its situation the later is the discovery of the disease. Cure in the case of cancer of the brain and spinal cord is relatively rare, but for skin cancer 80-90 per cent. of cures are obtained. In cancer of the breast there are 40 per cent. of cures of five years' duration after the operation, and for the stomach and intestines 20-30 per cent. of cures can be reckoned on. Of the total operated on about 40 per cent. remain permanently healed, and in 60 there is a return of the disease, from which patients are seldom saved by repeated operations. About half of all cancer patients seek advice too late; in other words, nothing can be done but endeavour

to make what period of life remains as painless and comfortable as possible. The means to this end vary from case to case. Natural healing of cancer is a very rare phenomenon indeed, but instances on record are sufficiently authenticated to establish the possibility. In mice naturally suffering from cancer it has been shown that healing occurs in less than 1 per cent., but even this is sufficient incentive to investigate the mechanism of natural cure.

Modern Cancer Investigation.—Since 1898 there has been a great revival in the energy with which the study of cancer has been pursued. Britain has always played a prominent part in the investigation of cancer, and never more so than at the present time. A national organisation was founded in 1902 in London, and has so developed its organisation throughout India, the Colonies, and other dependencies that Edward VII. in July 1904 conferred on it the title 'Imperial Cancer Research Fund.' As such it has obtained the hearing of the whole scientific world and attracts workers from all parts of the globe. There are other important centres of investigation at the Middlesex Hospital and the Cancer Hospital, London; the Royal Cancer Hospital, Glasgow; the Pilkington Cancer Research, Manchester; the University of Liverpool; a sum of money was placed at the disposal of the Royal Infirmary, Dundee; and in Edinburgh there is the 'Dunlop Fund.' Similar activity is manifest on the Continent and in America.

See Paget, *Lectures on Surgical Pathology* (1853); Williams, *The Natural History of Cancer* (1908); Bland Sutton, *Tumours Innocent and Malignant* (4th ed. 1906); Powell White, *The Pathology of Growth* (1913); Cathcart, *The Similarity of Tumours* (1907); Cheyne and Burghard, *Manual of Surgical Treatment* (new ed. 1912-13); Reports of the Middlesex Hospital; Scientific Reports of the Imperial Cancer Research Fund; Annual Reports of the Registrar-general of Births, Deaths, and Marriages.

Cancer Root, or BEECH-DROPS (*Epiphegus virginiana*), a parasitic herb of the order Orobanchæ (q.v.), a native of North America, growing on the exposed roots of beech-trees. The whole plant is powerfully astringent.

Cancione'ro (Span.; Port. *cancioneiro*), 'song-book,' a collection of lyrical pieces by one or more authors; in particular, the designation of the official collections of the poetic guilds which flourished in the middle ages at the courts of Spain and Portugal. Perhaps the oldest is that of Dom Diniz of Portugal (1279-1325) and his court. There are also *cancioneros* of the courts of Aragon and Castile. The earliest *Cancionero General* was published about the end of the 15th century.

Cancrum Oris, also known as Gangrenous Stomatitis, Noma, or Water Canker, is a gangrenous affection of the mouth characterised by fetid sloughing ulcers, which sometimes attacks debilitated children or young persons recovering from measles or other acute fevers.

Candace. See ETHIOPIA.

Candahar. See KANDAHAR.

Candesh. See KHANDESH.

Candelabrum, a term properly meaning a candlestick, but used for a lamp-stand. Few articles were more beautifully wrought than the finer forms of ancient Roman candelabra. Often from 3 to 10 feet high, they were of great variety of form, and were made of marble, bronze, and the precious metals. The bronze candelabra of the Renaissance are also notable art objects.

Candia is the name of the former capital of the island of Crete (q.v.), and was long the only name by which the island was known in western Europe. The city, standing on the north coast, north of

Mount Ida and Knossos, was the only town in Crete where Turks were numerous. During the occupation by the powers, it was here, in September 1898, that the Moslem rising took place, in which a hundred British soldiers were killed and wounded, and which precipitated the definitive removal of all the Turkish garrisons. Pop. 25,000.

Candida Casa. See WHITHORN.

Candle, a cylinder of wax, paraffin, or fatty matter, enclosing a central wick, and intended for giving light. The chief raw materials employed in the manufacture of candles are wax and spermaceti for the more expensive kinds, and tallow, palm-oil, and paraffin for those in general use. Candles are made in three ways—viz. by basting and rolling when wax is the material employed, by dipping when tallow dips and the more modern 'snuffless dip' candles are made, and by moulding when stearin or paraffin or a mixture of both is the material used. The bulk of candles in use are made by this method. Paraffin candles are most largely used in the United Kingdom, but on the Continent stearin candles are preferred. Stearin, the trade-name for stearic and palmitic acids and mixtures thereof, is made from tallow and from palm-oil. It was made available for the manufacture of candles about 1832. Paraffin was practically unknown to the candlemaker until 1847-50, when it was produced in Scotland by Dr James Young from distillation of coal, and subsequently from shale. It is obtained also in large quantities from petroleum in the United States, in Galicia, in Rumania, in Burma, and other countries.

Candle-moulding.—The modern candle-moulding machine is an oblong cast-iron box fixed to frames at each end into which the candle-moulds are securely and accurately fitted. The tips of the moulds are movable, up or down, within the moulds, but they are fixed to the upper end of iron tubes, the lower ends of which are attached to an iron plate or table placed under the box. This table can be raised or lowered at pleasure by means of a rack and pinion fixed to the frames, and when actuated serves to force the candles out of the moulds. Under the table is fixed a box to hold the bobbins on which the plaited and chemically treated wick is wound, one bobbin for each mould. Plaited wicks, first introduced in France in 1825, are now generally used, and obviate the use of the old-fashioned snuffers. The end of the wick is drawn up through the tubes and the moulds by means of an elongated crochet-hook ready for the first filling, and to complete the machine it is provided with two movable clamps to hold one set of candles while another set is being moulded. By this means the wicks are held in position in the centre of the moulds for each succeeding change of candle material. Steam and water pipes are connected to the cast-iron box so as alternately to warm and cool the moulds before and after being filled. When candle-moulding is being done the candle material in a melted state is poured into two troughs at the top of the iron box into which the moulds are fixed, and in this way the moulds get quickly filled. The modern moulding-machines contain from seventy to three hundred moulds each, and produce that number of candles at each filling.

Candleberry, CANDLEBERRY MYRTLE, WAX TREE, WAX MYRTLE; TALLOW TREE, or BAY-BERRY (*Myrica cerifera*), a small tree, or more generally a low spreading shrub, a native of the United States, most abundant and luxuriant in the south. The evergreen leaves are dotted with resin-glands, and are fragrant when bruised. The drupes—popularly called berries—are about the size of

peppercorns, and when ripe are covered with a greenish-white wax; the wax is collected by boiling them and skinning, and is afterwards melted and refined. A bushel of berries will yield four or five pounds. It is used chiefly for candles, which burn slowly with little smoke, and emit an agreeable balsamic odour, but do not give a strong light. An excellent scented soap is made from it. Several species are found at the Cape of Good Hope, one of which (*M. cordifolia*) bears the name of Wax Shrub, and candles are made from its berries. The well-known Bog Myrtle (q.v.) or Sweet Gale is *M. Gale*.

Candle-fish (*Thaleichthys pacificus* or *Osmerus thaleichthys*), a remarkable fish of the family Salmonidae, nearly allied to the smelt (*Osmerus eperlanus*), if not in the same genus with it. It inhabits the Pacific Ocean, near the western shores of America, from Vancouver Island northwards, and is common in the bay of San Francisco. It is probably the fattest or oiliest of fishes, if not of animals, and is used by the Indians not only as an article of food, but for making oil. The extraction of its oil is now a regular business. To broil or fry it is nearly impossible, because it almost completely melts into oil. When dried it may be burned as a lamp. It is also known as *Eulachon* or *Oulachan*.

Candlemas, an ecclesiastical festival observed on 2d February in honour of the Purification (q.v.) of the Virgin Mary, when she presented the infant Jesus in the temple. The great feast of expiation and purification (*Februa*) in ancient Rome was held on the 15th of February, and the origin of the Christian festival is explained by some as a mere turning to Christian account of the ancient heathen rite. At any rate, the festival seems to have been instituted by the Emperor Justinian in 541 or 542. A principal part of the celebration is a procession with many lighted candles, and those required for the service of the ensuing year are also on that occasion consecrated; hence the name.

The candle-bearing, as old at least as 665, was early explained as a reference to the words of Simeon, when he took the infant Jesus in his arms and prophesied that he should be 'a light to lighten the Gentiles.' The two ideas became associated in the popular mind, and it became customary for women on being *churched* after their recovery from child-birth to carry candles with them. The practice of lighting up the churches in England was prohibited by an order of council in 1548, but still continues in use in the Roman Catholic Church. One old Scottish custom was that the schoolmaster was on this day presented with small offerings by his pupils; and in Scotland this day is one of the four term-days. See **TERM**.

There is a tradition all over Christendom to the effect that a fine Candlemas portends a severe spring. Sir Thomas Browne in his *Vulgar Errors* quotes a Latin distich expressive of this idea. In Scotland the prognostication is expressed in the following distich:

If Candlemas is fair and clear,
There'll be two winters in the year.

Christ's Presentation, the Holiday of St Simeon, and, in the north of England, the Wives' Feast-day were names given to Candlemas Day. See Ellis's edition of Brand's *Popular Antiquities*.

Candle-nut (*Aleurites triloba*), a small tree of the order Euphorbiaceæ (q.v.), a native of the South Sea Islands, Madagascar, Moluccas, Java, &c., which produces a heart-shaped nut with a very hard shell, and a kernel good to eat when roasted, although in a raw state it possesses in a slight degree some of the active properties so common in the Euphorbiaceæ, and is apt to cause purging and colic. It is about as large as a walnut. An excellent bland oil is procured from it, used

for food, as a lamp-oil, and for making soap, paint, and varnish. The Tahitians bake them in an oven, remove the shell, bore holes through the kernels, and string them on rushes, hanging them up in their houses, to be used for torches, which are made by enclosing four or five strings in a leaf of the screw-pine (*Pandanus*). These torches are often used in fishing by night, and burn with much brilliancy. The lampblack used in tattooing was obtained from the shell of the candle-nut. A gummy substance exudes from the candle-nut tree, which the Tahitians chew.

Candlish, ROBERT SMITH, a great Scottish ecclesiastic, was born in Edinburgh in 1806, but was brought up and educated at Glasgow. Entering the university at twelve, he graduated five years later, and after the usual studies in divinity, and living two years at Eton as private tutor to a Scots pupil there, was licensed as a preacher in 1828. From 1834 he was minister of St George's, Edinburgh, famous for the fervid eloquence and intellectual force of his sermons. Ere long he became one of the boldest and most vigorous leaders of the popular or 'non-intrusion' party. After the Disruption he co-operated with Dr Chalmers in organising, consolidating, and extending the newly formed Free Church of Scotland, and from the time of Chalmers's death down to his own was its virtual leader. He was Moderator of the Assembly in 1861, was made in 1862 Principal of the New College, and in 1865 D.D. by Edinburgh University. Candlish took a foremost part in all the questions discussed within the first thirty years of the life of the Free Church, but his name was most permanently associated with public education, and the movement for union with the other dissenting Presbyterian bodies. He died at Edinburgh, 19th October 1873. Candlish's works were *Contributions towards the Exposition of the Book of Genesis* (1842); *The Atonement, its Reality and Extent* (1845); *An Examination of Mr Maurice's Theological Essays* (1854); *The Fatherhood of God* (1865); and an *Exposition of the First Epistle of St John* (1874). See his *Life* by Dr W. Wilson (1880).

Candolle. See DE CANDOLLE.

Candy. See KANDY.

Candytuft, the familiar name for various species of *Iberis*, forming a genus of the order Cruciferae, popularly distinguished by unequal petals, the two larger being towards the circumference of the dense corymbs. The species are chiefly found in the Mediterranean countries, and the English name is supposed to be derived from that of the island of Candia (Crete), the name *Iberis* from Iberia (Spain). One species, *I. amara*, remarkable for its bitterness, is a doubtful native of England. Some species are slightly shrubby, some are herbaceous perennials, some annuals. Some are among the most familiar ornaments of our flower-gardens.

Cane, a term sometimes indiscriminately applied to any small and smooth rod, of the thickness of a walking-stick or less, but more correctly limited to the stems of the smaller palms and the larger grasses. We thus speak of sugar-cane, bamboo-cane, &c., among the latter; while among the former the name is particularly appropriated to the species of the genus *Calamus* (see **RATTAN**). To this genus belong the canes largely imported from the tropical regions of the East for making chair-bottoms, &c. See **BAMBOO**, **WALKING-STICK**.

Canea (Gr. *Khania*), the present capital of Crete, is situated on the north-west coast, and has a fine harbour. It occupies the site of the ancient *Cydonia*, but the present town is due to the Venetians, from whom it was wrested by the Turks after a two years' siege in 1669. Canea is the principal mart for exporting the productions of the

island—oil, wax, soap, &c.; its harbour is good though shallow. Pop. 24,000.

Cane-brake, a thick mass of *Arundinaria macrosperma*, a colossal reed, nearly allied to the bamboo, which reaches a height of 30 or 40 feet, and forms dense swamp-jungles (sometimes of wide area) in marshy places, and along the banks of the Red River, the Arkansas, the Mississippi, and their tributaries.

Canella (*Canella alba*), a small tree belonging to the natural order Canellaceæ, common in the West Indies, where it is often called Wild Cinnamon. The bark of the young branches is the *Canella Bark* (White Cinnamon) of apothecaries, and is imported from the Bahamas. It is aromatic and stimulant, but now seldom employed in medicine; in the West Indies it is used as a condiment. —Other genera of Canellaceæ are Cinnamodendron (Brazil and West Indies), Cinnamosma (one species, in Madagascar), and Warburgia (one species, in East Africa).

Canelones, a fertile department of Uruguay; area, 1827 sq. m.; population, 120,000. Capital, Guadalupe, 30 miles N. of Monte Video by rail; pop. 3000.

Cang, or CANGUE, an instrument by means of which petty offenders in China are punished. It consists of a large wooden collar fitting close round the neck, varying in size and weight, but not to be removed by day or night during the whole period of punishment, which may vary in length from a fortnight to three months. Its form prevents the victim from stretching himself at full length, and upon this depends in great part the severity of the punishment. He is left also to be starved or fed by the public at their pleasure. The prisoner's name and the nature of his offence are written on the cang in large letters.

Canicatti, a town of Sicily, on the Naro, 24 miles ENE. of Girgenti by rail. Near it are sulphur-mines. Pop. 25,000.

Canicular Days, named from Canicula, Sirius, or the Dog-star, are the Dog Days (q.v.). Canicula is in the southern constellation of Canis Major, near which is that of Canis Minor. For the canicular year, counted from the heliacal rising of the Dog-star, see YEAR.

Canidæ, or CYNIOIDEA, a family or section of Carnivora, occupying a position midway between the cats on the one hand and the bears on the other. The number and disposition of the teeth is less specialised than that of other Carnivora. Other distinctive characters are noted under CARNIVORA. Huxley divided the family into two parallel series: (a) *Thooïd* or *Lupine* types—e.g. Dogs, Wolves, Jackals; and (b) *Alopecoid* or *Vulpine* types—e.g. Fox, Fennec, Lycaon or Cape Hunting Dog, and the primitive Otocyon. Some fossil Canidæ such as Amphicyon and Cynodictis are still more generalised. See DOG, FOX, JACKAL, WOLF, &c.

Canina, LUIGI, architect, born at Casale, in Piedmont, 23d October 1795, was professor of Architecture at Turin, and afterwards lived in Rome, where he published works of great value on the antiquities of Rome, Veii, Etruria, and Tusculum. He died at Florence, 17th October 1856.

Canister Shot. See CASE SHOT.

Canker is a malignant disease of the horse's foot. It usually attacks horses which have large fleshy-looking frogs, and commences by discharge from the heels or the cleft of the frog. The horn becomes soft and disintegrated, the vascular structures beneath become inflamed, and the horse is lame. Though there is no fever, he becomes emaciated and unfit for work. During wet weather, and on damp soil, the symptoms

increase in severity. The diseased tissues bleed on the least touch, and considerable fungoid granulations, commonly called proud flesh, form rapidly, and there is a continuous discharge of a dirty fluid, which has a most offensive smell. It is most frequently seen in low-bred draught or coach horses, though it also, with too much frequency, affects Clydesdale and other stallions. Dirt, cold, and wet favour the production of the disease, and there is always a tendency to relapse when once an animal has been affected. By way of treatment, pare away detached portions of horn, and, in mild cases, sprinkle powdered acetate of copper over the sore; apply over this pledgets of tow, fixed over the foot by strips of iron or wood passed between shoe and foot. In severe cases tar and nitric acid, creosote and turpentine, chloride of zinc paste, and other active caustics have to be used for a time with the regular employment of pressure on the diseased surface. The animal requires to be treated constitutionally, and good food, fresh air, and exercise often aid much in the treatment of the disease.

Canker, a disease of plants fatal especially to fruit-trees. It is caused by a fungus, *Nectria ditissima*, which finds an entrance through wounds. See PLANTS (Diseases).

Canna, a genus of reed-like plants, type of the order Cannaceæ (often united to Marantaceæ), some species of which (especially *C. Indica*) are known from their hard heavy seeds as Indian Shot. Natives of the tropics, they are cultivated in our gardens for their ornamental foliage and show of flowers. The root-stocks are farinaceous, and one species in the West Indies yields the starch called *tous-les-mois*.

Canna, one of the Inverness-shire Hebrides, 12 miles SW. of Skye, and 3 NW. of Rum. It is $4\frac{1}{2}$ miles long, 1 mile broad, and $4\frac{1}{2}$ sq. m. in area. The surface is nowhere higher than 800 feet. A hill of basalt, called Compass Hill, reverses the magnetic needle.

Cannabinaceæ, a sub-order of Moraceæ (q.v.), containing two genera, both of them valuable, *Cannabis* and *Humulus*. See HEMP and HOP.

Cannæ, an ancient town of Apulia, in southern Italy, not far from the mouth of the Aufidus (now Ofanto), and $1\frac{1}{2}$ mile N. of the modern Canosa. Here, in the summer of 216 B.C., Hannibal (q.v.) with 50,000 men defeated with prodigious slaughter a Roman army of 86,000 men under Æmilius Paulus and Terentius Varro.

Cannamore, a seaport and military station of the district of Malabar, in Madras, about 50 miles to the N. of Calicut. The town stands at the head of a bay; while the fort and cantonment occupy the bluff headland which shelters the inlet on the side of the Arabian Sea. The town has several mosques, and there is a lighthouse in the old fort. Pop. 30,000.

Cannes, a watering-place in the French department of Alpes-Maritimes, charmingly situated on a bay of the Mediterranean, 17 miles SW. of Nice. Founded by the Romans on a promontory between their *Via Aurelia* and the sea, during the middle ages it was held as a fief by the convent of the Lérins, and Abbot Adelbert began to build the *Vigié* or watch-tower in 1070. It was repeatedly attacked by the Barbary pirates, and twice entered by Charles V. The most disastrous year ever known was 1580, that of the great plague; though during the wars of religion it was sacked by the Duke of Savoy. When Masséna lived in it and Murat gave a ball on the shore (1815), it contained about 3000 inhabitants. It was in the roadstead of the Golfe Jonan that Napoleon landed when he

returned from Elba. Entering Cannes after dusk, he made his bivouac on the shore, but left it at 2 A.M. of the 2d March 1815, to march by the hill road, *viâ Grasse and Digne*, upon Grenoble and Paris. Lord Brougham first (1834) selected Cannes as a health-resort. Pop. 31,000, doubled in winter. Alexis de Tocqueville, Prosper Mérimée, Louis Blanc, Victor Cousin, Auerbach, and J. B. Dumas died in Cannes.

Cannes is celebrated for the salubrity of its climate. A range of low wooded hills shelters it from the north, and it occupies the centre of the great curved bay, 14 miles in width, of which the Cap Roux and the Cap d'Antibes form the extremities. It has a small port, and a trade in flowers. There are farms of violets, roses, oranges, tuberose, jessamine, and cassia.

Cannibalism, the practice of eating human flesh as food, is widely spread among many of the lower races, but has not infrequently held its place even among peoples at a comparatively high level of culture. It has been held that primitive man would eat human flesh from mere famine or necessity—as has often been done in extreme cases even in the higher races under the pressure of the same forces—but would leave off the practice as he climbed in culture. But this is by no means always the case; the ancient Mexicans, a people of exceptionally high native culture, were yet excessively addicted to cannibalism. And even at the present day some of the most advanced and advancing of negro races, the Monbuttus, Zandebs, Fans, and other tribes in the large central zone of anthropophagy that crosses Africa from east to west, habitually practise cannibalism in its most repulsive forms, even to the length of buying and selling human flesh for ordinary diet. Again, the New Guineans are fine men physically and intellectually; and the Maoris of New Zealand were cannibals till near the middle of the 19th century. Nowhere was the practice more widespread than in the South Seas, especially in the Fiji, New Hebrides, and New Caledonian groups. If it be true that the primitive reason for the practice is sheer hunger or the desire to eat flesh, the habit, once contracted, would grow into a confirmed appetite. Upon cannibalism from necessity or mere gluttony follows easily enough cannibalism from war-like fury, as was very common with the North American Indians, among whom eating the flesh and drinking the blood of an enemy meant something more than metaphor. Cannibalism among the Battas seems to spring from the idea of giving the dead relative the safety of a friendly grave in the stomachs of his living relatives. Aged relations and new-born children, as well as friends or children who had died by mischance or mere accident, have been eaten by many primitive peoples, notably in Australia. Often a savage desires to eat the flesh of a valiant enemy in order that his courage might pass into himself—a magical or religious cannibalism, almost a kind of eucharistic rite, which marks the highest development of the practice, and was found among Maoris, Australians, North American Indians, and the old Aztecs. The notion of presenting food to the gods is almost universal among savage peoples, and this would naturally be human flesh among a people to whom cannibalism was customary. It seems to have been proved that human sacrifices with no other origin than cannibalism survived even in cultured Greece. On the other hand, there are Australian tribes who eat their slain friends but not their enemies, while others eat their new-born children, or in some cases only the eldest. In one tribe a mother eats her own children, and the children their mother; while the father does not feed on his offspring, nor the offspring on their

father—an undoubted survival of female kinship, when the father, as a member of a different tribe, had no right to eat the flesh of his own child. Apparently cannibalism was not a normal condition of the life of primitive man, whose dentition and digestive organs of themselves point rather to a diet of fruits; originally it was no more than an occasional practice, as in historic times. Yet so ingrained does the habit become that in French Equatorial Africa, as Bondet-Saint reports, since the suppression of cannibalism, the loss of this wholesome and abundant nourishment has produced unmistakable physical degeneration amongst certain anthropophagous tribes. Some contend that the origin of cannibalism must always be sought in actual hunger, and that the magical and religious usages were later developments. Others insist that this will not explain some customs—for example, the law that in certain tribes prescribes that the members of it shall eat only their fellow-tribesmen, and that here at least a ritual or ceremonial origin must be assumed. In view of the very varying laws and customs of anthropophagy, it is perhaps safest to hold that the origin has not everywhere been the same or even similar, and that the unholy habit has not in every race or region had the same historical development.

Canning. See PRESERVED PROVISIONS.

Canning, CHARLES JOHN, EARL, third son of George Canning, was born 14th December 1812, and was educated at Eton and Christ Church, Oxford, where he obtained high honours. He entered parliament in 1836 as Conservative member for Warwick, but next year was raised to the Upper House as Viscount Canning by his mother's decease, both his elder brothers being already dead. In 1841 he became Under-secretary of State for Foreign Affairs in Sir Robert Peel's government, and afterwards Commissioner of Woods and Forests. When Lord Aberdeen came into office, he was made Postmaster-general; and in the beginning of 1856 he succeeded Lord Dalhousie as Governor-general of India. The first important event of his government was a war with Persia, which was brought to a successful close in 1857. In the same year (10th May 1857) the Indian Mutiny began with the outbreak at Meerut. Lord Canning's conduct during the awful crisis was decried at the time as weak and pusillanimous; he was nicknamed 'Clemency Canning'; but the general opinion now, when all the circumstances of the case are better known, is that he acted with singular courage, moderation, and judiciousness. In 1853 he became the first Viceroy; next year he was raised to an earldom; but having lost his wife in 1861, he retired from his high office in March 1862, and died in London on 17th June in the same year. See Sir H. S. Cunningham's *Earl Canning* (1892).

Canning, ELIZABETH, the heroine of a remarkably obscure story, was born in 1734. Already she had been in domestic service for some years in London and borne a good character, when about nine o'clock on the night of New-year's Day, 1753, she disappeared on her way home from a visit to an uncle and aunt's house. Neither the loudest hue and cry nor prayers in the churches had done anything to solve the mystery, when late at night (29th January), four weeks after her disappearance, the girl knocked at her mother's door, hungry and half-clad. She said she had been seized by two men and carried by force to a house on the Hertfordshire road, where she had been ill-used by an old woman, and starved in an upper room, to compel her to an immoral life. She identified Susannah Wells and an old gypsy named Mary Squires as her persecutors, and these were accordingly arrested, and they passed in the first stage before the novelist Henry

Fielding, then a Bow Street magistrate, who afterwards published a paper on the case; next they were tried at the Old Bailey, and sentenced, in spite of an alibi for Squires sworn by three witnesses, Squires to be hanged, Wells to be burned in the hand. The Lord Mayor, Sir Crisp Gascoyne, felt unsatisfied with the verdict, and made further investigations, which resulted in so strong an accumulation of fresh evidence to fortify Squires's alibi that a free pardon was granted her by the crown. The case now became the excitement of the town, and opinions were fiercely divided between the 'Canningites' and 'Gypsyites,' so that the heroine of this miserable story became in Churchill's phrase, 'with Gascoyne's help, a six months' feast.' On the 29th April 1754 she was put on trial at the Old Bailey for perjury, and after an eight days' trial, in which the jury seem to have been completely puzzled between the thirty-eight witnesses who swore that Squires had been seen in Dorsetshire, and the twenty-seven who swore to her having been in Middlesex, was found guilty, and sentenced to transportation for seven years. She was sent to New England, and died in Connecticut in 1773. See Paget's *Paradoxes and Puzzles* (1874).

Canning, GEORGE, a distinguished British statesman and orator, was born in London, 11th April 1770. His father, who claimed descent from William Canynge of Bristol, incurred the displeasure of his family for marrying beneath his station, and died in poverty when his son was only a year old. His mother tried the stage with but little success, married an actor, and subsequently a linen-draper, but lived to rejoice in the success and participate in the good-fortune of her boy, whose education was liberally provided by his uncle, Stratford Canning, a banker. Canning was sent to Eton, from which he passed at the age of eighteen to Christ Church College, Oxford, where he greatly distinguished himself, especially in classics. While here, he cherished the friendship of the Hon. Charles Jenkinson (afterwards Lord Liverpool), who was of considerable service to him in after-life. From Oxford he went in 1790 to Lincoln's Inn, but on the suggestion of Burke, as it is said, he soon relinquished the bar for a parliamentary career. He entered the House for Newport, Isle of Wight, in 1794, as the protégé and supporter of the minister, Pitt. In 1796 he was appointed an under-secretary of state. It was not, however, until 1798 that Canning made a reputation as an orator and a statesman, by his speeches in favour of the abolition of the slave-trade and against Tierney's motion regarding peace with the French Directory, the latter of which, especially, was regarded as a masterpiece of eloquence, alike by the House and the country. In many important questions Canning gave valuable assistance to the ministry, not only by his voice in parliament, but by his pen in a satirical paper called the *Anti-Jacobin* (1797-98), in which (with Hookham Frere, George Ellis, and others) he especially lashed the 'New Philosophy,' as it was called, promulgated by the French republicans. The 'Needy Knife-grinder' is one of the best known and happiest efforts in this kind. In 1800 he made a happy marriage with Joan Scott, a lady of fortune, and sister to the Duchess of Portland. In 1801 Pitt resigned office, and Canning joined the opposition from the ministerial side of the House against the Addington ministry.

When Pitt again became premier in 1804, Canning was made treasurer of the navy, an office which he held until Pitt's death in 1806. His opposition to the short-lived Grenville ministry which succeeded savoured of the bitterness of party feeling, and his treatment of Fox in his last

days, and of his memory after his death, was far from generous. When the Portland ministry was formed in 1807, Canning was appointed Minister for Foreign Affairs, a position for which he was specially qualified, and his despatches written at this time are models of manliness and lucidity. During his tenure of office Canning planned the expedition for the seizure of the Dutch fleet, which did so much to upset the schemes of Napoleon; and he recommended the energetic prosecution of hostilities in Spain both under Moore and Wellesley. His disapproval of the Walcheren expedition led to a misunderstanding with Castlereagh (q.v.), secretary-at-war, which resulted in a duel with that statesman. Soon afterwards the Portland ministry came to a close, and Canning did not hold high office again for many years. His absence from the Foreign Office during the critical period at the close of the Napoleonic wars was to Canning a subject of lasting regret. In 1812 all his eloquence was enlisted in favour of Catholic emancipation. During the same year he was elected for Liverpool, which seat he exchanged for Harwich in 1822. In 1814 he went as ambassador to Lisbon, returned in 1816, and was made President of the Board of Control, and supported the Liverpool ministry in all their arbitrary and repressive measures until 1820, when he resigned, in consequence of the action of the government against Queen Caroline.

Nominated Governor-general of India in 1822, he was on the eve of departure when the suicide of Castlereagh, now Marquis of Londonderry, called Canning to the head of Foreign Affairs. In this capacity he conferred lasting benefits on his country. He infused a more liberal spirit into the cabinet, he asserted the independence of British politics against the diplomacy that would have entangled the nation with the Holy Alliance, and gave a new direction and impetus to commercial affairs by a gradual laying aside of the prohibitive system. He arranged the relations of Brazil and Portugal; drew the French cabinet into agreement with the British respecting Spanish-American affairs; was the first to recognise the free states of Spanish America; promoted the treaty combining England, France, and Russia, for the settlement of the affairs of Greece, which was signed 6th July 1827; protected Portugal from Spanish invasion; contended earnestly for Catholic emancipation; and prepared the way for a repeal of the corn laws. In February 1827 a stroke of paralysis forced the Earl of Liverpool to resign, and Canning was called upon to form a new administration, which he did with the aid of the Whigs. His health, however, gave way under the cares of office, and he died 8th August of the same year at the Duke of Devonshire's Chiswick villa, in the room where Fox had died twenty-one years earlier. He was buried, near Pitt, in Westminster Abbey. As a parliamentary orator Canning holds a prominent place in British annals. His acuteness, power of expression, and well-pointed wit were remarkable; he lacked the imposing character of Pitt, the overpowering enthusiasm of Burke, and the winning address of Fox; but he was intensely British, and his foreign policy was carefully calculated to promote British interests.

See his *Speeches* edited by Therry (6 vols. 1828); Stapleton's *Political Life of Canning* (1831), and *George Canning and his Times* (1859); the masterly sketch in Lord Dalling's *Historical Characters* (1867); Lives by Frank Hill (1887), Marriott (1903), and Temperley (1905).

Canning, STRATFORD. See STRATFORD DE REDCLIFFE.

Cannock, a town of Staffordshire, 8 miles NNW. of Walsall; pop. (1851) 2099; (1921) 32,321. The adjoining bleak and moory Cannock Chase, an enclosed common, is rich in coal and iron.

Cannon, a strong tube, closed at one end permanently (muzzle-loading) or as required (breech-loading), for propelling missiles by the force of the gases of an explosive fired therein. The word is derived from the Latin *canna*, a reed or pipe. The term 'cannon' also implies a weapon of greater size than can be transported or handled by a man, and therefore provided with some sort of mounting or carriage on which it is manipulated or transported. The word 'cannon' is not now commonly used, but has been superseded by the word 'gun.' Unfortunately the word 'gun' is also used for the sporting small-arm—the military small-arm being termed a rifle.

Included under cannon are howitzers and mortars. Howitzers are short guns of large calibre in proportion to their length, and are intended for firing at higher angles and lower velocities than guns. They are designed for searching out, by curved fire, troops or material under cover. They are mounted and used similarly to guns, but are provided with several charges designed to enable them to employ the highest possible angle of elevation, and therefore the steepest angle of descent for their projectiles, at all ranges. Mortars were still shorter than howitzers. They were fixed in their 'beds' (mountings) at a permanent angle of elevation of 45°, and their charges were varied in order to obtain the range required. They played a great part in the attack and defence of fortresses during the smooth-bore period, and for nearly 300 years were the only weapons which fired a shell filled with explosive and furnished with a time-fuse. They have been quite superseded by howitzers for ordinary warfare where mobility is essential, but reappeared in trench warfare in 1914-18. (See BOMBS.)

The history of the invention and early development of the propulsion of projectiles by explosives will be found in the article on Firearms; and the *bombard* period, which lasted from about 1330 to 1450, and during which cannon, often of great size and sometimes breech-loading, were built up of bars and hoops of wrought-iron, is passed over without comment. The transition period also—from 1450 to 1500 approximately—in which the casting of cannon began to be generally adopted, although the bombard form was sometimes retained, calls for little remark, for it is not too much to say that the effect of this early artillery was almost wholly moral, except for its power of making breaches in fortifications.

During the next fifty years the bombard form disappears, and cannon, cast both in bronze and

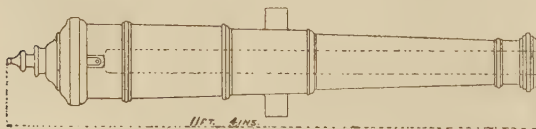


Fig. 1.

iron, possess every feature appearing in those cast during the next 300 years.

Fig. 1 represents a 6-inch iron 'Cannon Royal' of 53 cwt. of the time of Henry VIII. It would be a 27-pounder gun approximately (making an allowance of 0.2 inch for windage), and compares well with the 24-pounder broadside gun of Nelson's time and later. The naval broadside mounting, judging from a drawing in *Artiglieria* by Sardi (Venice, 1621), had also probably assumed the form which it was to retain during the same period (see fig. 2 of a 24-pounder gun and carriage as in use up to the end of the smooth-bore period).

Fig. 3 shows a field-gun and carriage of the end of the 16th century from the *Prattica Manuale*

dell' Artiglieria by Collado (Milan, 1606), which has practically all the essentials of such combinations until the adoption of limber-boxes towards the end of the 18th century. Contemporary treatises show that the rammers, sponges, and 'side-arms' generally used for loading were very similar to those now in use, that made-up cartridges in bags were known, and that the essentials of good gunpowder were well understood at this time.

Figs. 4 and 5 are taken from Tartaglia's *Colloques* and Lucar's Appendix thereto (London, 1588), and represent respectively the 'gunners' square' and 'gunners' rule.' The former was used, unchanged

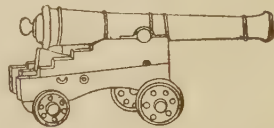


Fig. 2.

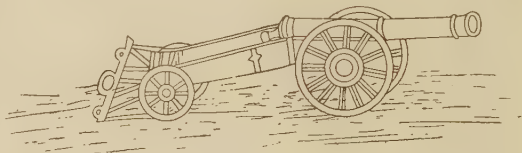


Fig. 3.

in form, until about 1830, for giving quadrant elevation, when it began (in the British service) to be superseded by the quadrant with a spirit-level instead of a plumb-bob. The 'gunners' rule' is quite a refined instrument, and was probably rarely used; for had it met a regular want, especially after the adoption of 'quarter-sights,' described hereafter, the adoption of the tangent scale, which is only a modification of it and much more handy, could not have been delayed for close on 200 years. The 'gunners' rule'

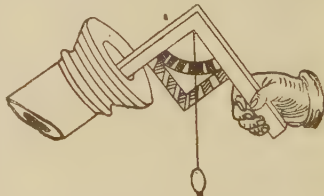


Fig. 4.

was placed centrally on the breech of the gun, with the central slider carrying the peep-hole clamped at the required elevation (in the figure it is set at division 3), and aim was taken by looking through the peep-hole and bringing a pin, or more probably a notch, on the centre of the top of the muzzle and the object aimed at into one line. It will be noticed that in this example (though not usually) a plumb-bob and scale are also provided for giving quadrant elevation, or by turning the instrument through 90°, for ascertaining the level of the trunnions. It may be added that the effect of the axis of the trunnions not being horizontal, in altering the direction of the flight of the projectile, was quite well known.

As to projectiles, shell-fire from guns did not come in for over 200 years (with the exception of its use by the defenders at the siege of Gibraltar

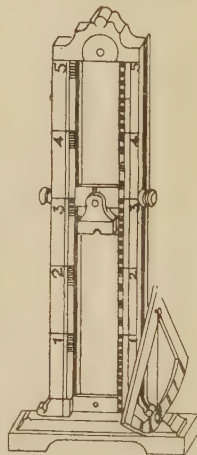


Fig. 5.

in 1779-83—an isolated instance) owing to the lack of a good time-fuse, and shot of various kinds were the only projectiles; but shell-fire with time-fuses from mortars had been used as early as 1543.

It will thus be seen that most of the essentials of a good artillery were well known at the close of the 16th century; and the efficiency of artillery, as proved by actual results in war, was in marked contrast with the inefficiency of the small-arms of the same period, for as late as 1590 there were advocates for the long-bow, owing to the inaccurate and slow fire of small-arms. During the remaining 250 years of the smooth-bore period there were many improvements in ammunition and in lightening the field-artillery equipments to render them more mobile and handy; but there were no changes whatever in principle, and a skilled gunner of the end of Elizabeth's reign would have found little or nothing wholly unfamiliar in the armaments of 1850.

The period 1500 to 1600 should be of extraordinary interest to the Briton, for in it were evolved the system of naval armament and the method of using it, which remained practically unchanged during the building up of the British Empire, in which sea-power has had such an enormous influence.

Briefly put, at the commencement of the reign of Henry VIII. the notion was undisputed that the galley propelled by oars, which fought by ramming and then by boarding with soldiers, and hardly employed artillery fire at all, was the warship *par excellence*; and, even in the case of sailing-ships, that the governing tactics should be to get to close quarters and board with soldiers without much preliminary artillery action. Henry and his advisers started the reversal of these tactics by building ships heavily armed on the broadside, and intended first to disable the enemy by heavy artillery fire, and then only, and not even necessarily then, to come to close quarters and board. These new tactics were brought to perfection by the Elizabethan sailors; the galley ceased to exist as a warship, and the warship ceased to be regarded merely as a transport for soldiers to be used for boarding purposes.

As regards the manufacture of guns in England at this early period, mention is made in 1384 of 'William the Founder of London' selling guns, stones, and powder, but there is no definite mention of his making them. There is, however, no reason to suppose that England had necessarily to go abroad for guns, as there had been ironworks in Sussex from Roman times, and ordnance were made there in the 14th century. The first iron gun was cast in England by Hugget of Uckfield, in Sussex, in 1521. A similar claim is made for Hogge of Buxted, which place is within a few miles of Uckfield.

Turning now to later improvements, figs. 6 and 7 show a 6-pounder field-gun, carriage, and limber,

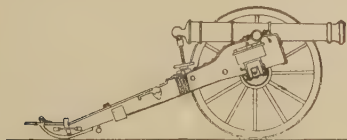


Fig. 6.

and is typical of the equipment of the British Field Artillery from the commencement of the 19th century until the end of the smooth-bore period. It was of its kind excellent, and called forth quite extraordinary encomiums from the French experts in 1815 (see *Études sur le Passé et*

l'Avenir de l'Artillerie, by Napoleon III., Paris, 1846-71).

Though it does not appear in the figure, the gun (and all *field-guns* in the British service) was furnished with a tangent-sight. The exact date of the general introduction of this sight into the

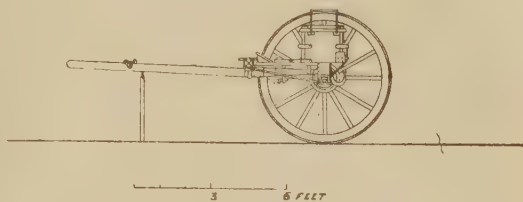


Fig. 7.

British service has not been quite definitely fixed, but it might have been as early as 1780, and certainly was earlier than 1794. In the French service this sight was tentatively adopted in 1765, and finally in 1774. The principle of this sight is shown diagrammatically in fig. 8 (a) and (b). During the time the projectile travels over the distance (MB) from the muzzle to the bull's-eye (B), it will, owing to gravitation, fall through a certain distance. The axis of the gun must therefore be pointed sufficiently above the target so that this fall shall bring the projectile on to the bull's-eye.

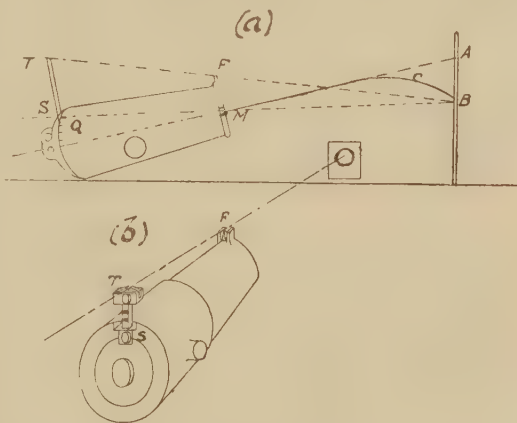


Fig. 8.

This is done by raising the notch, or peep-hole (T), of the tangent-sight bar (TS) to a certain height, corresponding with the range, above the socket on or in the breech, clamping it by the screw shown, and then getting the peep-hole, or notch, the foresight (F), and the bull's-eye (B) into a straight line. By this process the axis of the gun is directed a height (BA) above the bull's-eye (B). The tangent-sight is graduated to achieve a similar result at all distances up to the extreme range at which it is intended to employ the gun. The projectile travels over the curved path (MCB); see *PROJECTILES*. The tangent-sight in fig. 8 (b) shows a 'deflection leaf,' clamped by a milled-headed screw, for giving deflection to allow for wind, &c. This was not introduced until 1860.

Prior to the adoption of tangent-sights, quarter-sights had been taken into use at least as early as 1734 for all guns used in the British naval service, and probably for land service also. These supplemented the 'gunners' square,' and probably wholly superseded the 'gunners' rule.' They consist (see fig. 8, a) of a notch (M) on the side of the muzzle and a scale (Q) of three to four notches,

representing degrees, on the side of the breech. The principle of their use is clear from the figure, in which the gun is 'layed' with 4° elevation by the quarter-sight. Experiments with tangent-sights commenced in the British navy at least as early as 1804, and by 1817 considerable numbers had been made, and were kept ready in store for use; but the date of the general adoption of these sights is not accurately known. The dates for the introduction of tangent-sights in the British services given above are considerably earlier than have hitherto been accepted; but see an article by the present author in the *Journal of the Royal Artillery*, vol. xxxix., No. 8 (Nov. 1912).

Tangent-sights were generally adopted for all guns in the land service in 1846, and during the last forty to fifty years of the smooth-bore period the siege and heavy field equipments had been rendered very fairly efficient. In fortresses, guns and carriages in important positions were mounted on traversing platforms. The carriages used were very similar to the naval carriage shown in fig. 2. Both carriages and platforms were usually of wood.

As already stated, there were practically no changes of importance in the heavier guns and mountings in the navy up to the end of the smooth-bore period; but the carronades (short guns of proportionately large bore, so named from being made at the Carron Ironworks, and invented in 1779) and smaller guns firing from the upper decks were in some cases provided with traversing platforms (see fig. 9). Prior to about 1734 it is

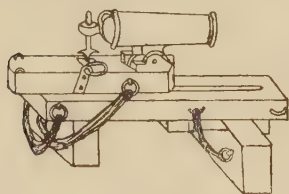


Fig. 9.

under the breech. The very short ranges at which naval engagements were usually fought probably rendered sighting refinements unnecessary.

Rifled Guns.—For the early history of rifling, the article on Rifles should be consulted. It was not until 1855 that rifling for cannon began to be seriously considered in Great Britain, though Robins had urged its adoption as early as 1745, and records exist at Woolwich of trials of a rifled 6-pr. gun in 1792. See an article by the present author in the *Journal of the Royal Artillery*, vol. xl., No. 4 (July 1913). There had also been some trials of rifled guns proposed by Major Cavalli and Baron Wahrendorff prior to 1846, and some of the existing smooth-bore guns rifled with two large grooves, forming an oval bore, on the Lancaster system, were sent to the Crimea in 1854—which guns burst badly, showing, as was soon accepted, that cast-iron guns were quite incapable of standing the greater strains put on them by the heavier elongated projectiles.

In 1855 Armstrong brought forward his breech-loading rifled gun, which, after prolonged trials, was adopted for the British service in 1859. A drawing and description of the breech mechanism of Armstrong's first system will be found in the article on Breech-loading; and, except in one particular, it is unnecessary to discuss fully the advantages and disadvantages of this system, as it lasted such a short time. The breech mechanism was not sufficiently safe if carelessly handled, and in the larger guns it was very cumbrous, while the lead coat on the projectiles, which was engraved by the rifling and gave rotation, was expensive, and its attachment to the projectiles not entirely reliable.

The guns, however, shot excellently, and were without doubt the best in existence at the time of their adoption.

It is, however, necessary to describe somewhat fully a novel feature in the construction of the bodies of guns made on the Armstrong system—viz. the building up of the gun in several parts. This method has been universally adopted, and is the foundation principle of gun manufacture at the present time, and, as far as can be seen, must always remain so.

In order fully to understand the object of Armstrong's innovation, it is necessary to consider the two main stresses to which the walls of the bore of a gun are subjected when it is fired and the gases of explosion are driving a projectile before them. The first, termed the circumferential stress, tends to split the gun along a more or less horizontal line; the other, the longitudinal stress, to tear the gun into two parts along some vertical line—assuming, of course, the gun to be approximately in a horizontal position when fired. The circumferential stress is the more difficult to meet, and is alone considered in what follows.

To resist rupture by circumferential stress we have, of course, the strength of the metal of the gun, but in a cast gun the different layers of metal forming the walls do not by any means all do an equal amount towards the prevention of rupture; for the stress on each layer can be shown to vary approximately inversely as the square of its distance from the centre of the bore. Thus, if we assume a gun of 12-inch calibre with a wall 10 inches in thickness, the outside layer only does approximately $\frac{1}{4}$ th part of the work done by the layer at the surface of the bore. It therefore follows that the metal near the bore can easily be strained beyond its endurance, however thick the walls may be, and the gun will be split, as it were, progressively. Armstrong solved the problem by making the gun in several layers, consisting of a tube of steel (at first of wrought-iron) over which were *shrunk* hoops or tubes of iron. This was effected by boring out the hoop to an interior diameter slightly smaller than the exterior diameter of the tube (or hoop where there is more than one layer) over which it is to fit. The hoop is then heated to expand it sufficiently to be fitted over the tube, and, on cooling, as it cannot return to its original size, is always gripping the tube with a force which follows known laws. It is therefore always ready to assist the tube immediately the latter is expanded by the powder gases on firing. This system is known as that of 'initial tension.' Obviously it cannot be applied so that each layer of a gun shall do exactly the amount of work theoretically required by its position, since that would necessitate the use of hoops infinitesimally thin, but it enables guns to be built up so that but little of the weight of metal used is wasted. In certain portions of wire-wound guns (to be discussed later), however, the disposition can be nearly theoretically perfect in this respect.

In 1866, troubles which occurred in the China war of 1860, owing to the breech-blocks occasionally blowing out, and a general dissatisfaction with the comparative complications of the Armstrong system, led to the adoption of rifled muzzle-loading guns in both services. These guns were built up on the Armstrong system, but with the number of layers of shrunk-on material somewhat reduced for cheapness' sake, and were quite as good as any foreign guns of their date, and of course extremely simple to handle. They differed, in fact, hardly at all from their smooth-bore predecessors, except in having elongated projectiles and better ammunition. Fig. 10 of a 38-ton 12.5-inch gun may be taken as typical of the construction.

The rifled muzzle-loading period may be said to have lasted until about 1882. During the sixteen years which it lasted the size of the guns made increased in an astonishing manner, owing mainly to the increase in thickness of the armour on warships and the efforts to produce guns firing projectiles designed to perforate it. At the end of the Armstrong breech-loading period in 1864, the biggest gun was the 7-inch of 81 cwt., propelling a projectile of 110 lb. By 1871 the 12-inch of 35 tons, with a projectile of 600 lb., had been made, and by 1882 there was the 16-inch of 80 tons in both land and naval service, with a projectile of 1700 lb., and in the land service a few 17.72 guns of 100 tons, firing projectiles of 2000 lb. These and the smaller guns constituted a highly efficient and formidable armament; but with the introduction of the large-grained, slow-burning gunpowders, moulded into prism form, which required great length of bore for their combustion and best ballistic effects, the days of muzzle-loaders, especially for use on ships, were numbered. To run back these long guns to get at their muzzles in order to load necessitated provision of great space in rear of them—space which could not possibly be spared on board ship.

The adoption of rifled guns immediately necessitated many alterations in the mountings; and although some of the earlier naval and fortress

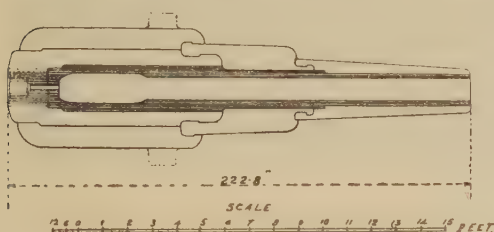


Fig. 10.

rifled guns were mounted on carriages which differed little from those used for smooth-bores, the rapid increase in the size and power of guns necessitated drastic changes in the mountings to control the recoil, and also to enable the guns to be handled. This was especially the case on board ship, where the pitching and rolling of the ship brought in special difficulties. Powerful gear had to be introduced to replace the old rope-tackles and handspikes, and on board ship the heavier guns had to be worked by hydraulic power. To control the recoil special mechanical means had to be introduced to check the movement of the gun and carriage to the rear, and to bring them to rest. In early times on board ship the necessary resistance had been provided by the friction of the rope in the blocks forming part of the tackles by which the gun-carriage was attached to the side of the ship (assisted by heavy 'breaching ropes,' which passed round the breech of the gun and brought it up short when the extreme recoil permissible was reached), and hauled back into the port for firing, after the gun had been loaded, in the recoiled position. On land the incline upwards to the rear of the gun emplacement or traversing platform, coupled with brake-scothes on the wheels of the carriages (or in some cases, there being no wheels, on the rear cross-piece at the bottom of the carriage, so that there was great frictional resistance), served to check recoil. After a short period, in which it was sought to govern recoil by the friction of plates on the platform jammed between plates on the carriage, the recoil-buffer was introduced, which has become as essential a feature of modern

heavy mountings as initial tension in the gun. The principle of the arrangement is shown diagrammatically in fig. 11. The mounting has two buffers, one of which is shown in section. A is a cylinder full of oil attached to the underside of the carriage (B). In A travels a piston (C) attached by a rod (D) to the front of the platform (E) at F. The piston (C) has holes in it. If now the carriage move to the rear, in the direction

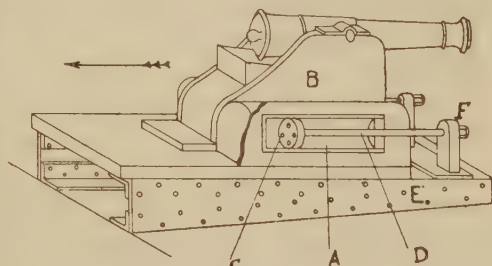


Fig. 11.

of the arrow, the oil in the cylinder must pass through the holes in C from the front to the back of the cylinder. Great friction is set up by this passage of the oil, which, however, can be regulated with extreme precision, and an ideal method of checking recoil is obtained. As stated, the system is only dealt with diagrammatically, and there are endless variants of the principle. The buffer often contains a spring which is compressed during recoil, and runs the gun out to the firing position independently of gravity. Steel or iron absolutely replaced wood as a material for the larger mountings, and in the case of siege-mountings also, steel or iron rapidly replaced wood; and although the field-guns were at first mounted on wooden carriages, these were soon replaced by iron ones.

Second Breech-loading Period.—The last new muzzle-loading gun—a 10.4-inch—was made in 1887 and after the second breech-loading period commenced about 1882. The description of breech mechanism adopted will be found in the article on Breech-loading. Apart from this change, the increased reliability of steel had permitted of the all-steel construction of guns being adopted, with the result that for the same weight a gun of greatly increased power could be produced. Fig. 12 shows a 9.2-inch gun of this construction, to which guns as large as the 16.25-inch of 110 tons weight were made. Guns larger than 12-inch calibre were not

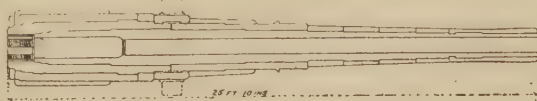


Fig. 12.

made between about 1895 and 1910, as it was considered that the gain in power was compensated by the increased difficulties in control of recoil and in provision of ease of handling.

All large and many small guns made for the British services since 1894 have wire wound over their inner tubes to provide circumferential strength instead of the shrunk-on hoops already described. Fig. 13 shows a 12-inch wire-wound gun. The wire is shown by the longitudinal hatching, and it will be noticed that a 'jacket' in rear and a tube in front completely cover the wire, while the jacket locks the front of the gun to the breech, giving the necessary stiffness, in addition to that of the inner tubes, to prevent the gun bending by its own

weight. As there has been a good deal of discussion and criticism of the wire-wound gun, it may be well to touch briefly on the merits and demerits of wire-winding. Taking the latter first, the only objection which can be urged against wire is that it adds absolutely nothing to the longitudinal strength of a gun, whereas with the shrunk-on hoop system, even if the hoops be numerous and small, a certain amount of cohesion of the hoops can, by suitable arrangements, be obtained; and such a gun will be stiffer and less liable to bend by its own weight. The answer to this is that with a suitable jacket ample strength can be, and is, provided to resist bending and, in conjunction with the inner tubes forming the bore, to meet the longitudinal stress of firing. The advantages of the system are that every yard of the wire is tested, whereas only a minute part of a hoop can be so tested, and the result of such a test is not necessarily a guarantee of the whole; that steel wire is much stronger and tougher than steel in hoop form, and as a result the margin of safety with it is much higher if it be only stressed to the same degree as a hoop, as is usually the case, or, if necessary, less of it can be used and a lighter gun be produced of the same power; and, lastly, that the required initial tensions can be much more accurately and easily given by winding than by boring and shrinking.

It will be noticed in fig. 13 that 'thrust-collars' instead of trunnions are provided, and that the inner tube forming the bore is covered by another

tube. The object of the latter is to provide for easy retubing when the rifling has been worn and eroded by firing. A modern 12-inch gun with a muzzle velocity of about 2800 to 2900 feet per second requires a new tube after firing about 150 rounds, so that such a provision is very necessary.

Quick-firing Guns.—The 6-pounder and 3-pounder guns, which have a cartridge similar to that of a rifle—i.e. have the projectile with its charge and cap combined—were adopted in the British service as early as 1885 for repelling the attack of torpedo-boats. These guns are mounted in 'cradles,' in which they have an axial recoil, controlled by hydraulic buffers, which buffers are also provided with springs by which the gun is returned to the firing position immediately after recoil. The cradle is attached by trunnions to a pivot, which is carried on, and can turn round in, a pedestal which is firmly fixed to the deck or gun emplacement. To the cradle is attached a shoulder-piece, and a pistol-grip and trigger are provided in such a position that a man can comfortably reach it with his right hand, while with his shoulder against the shoulder-piece he can traverse or elevate the gun as he looks over the sights. In effect he uses the gun just as he might use a rifle if it were mounted on a pivot. A second man opens and closes the breech, and a third man supplies ammunition.

In 1888 Messrs Armstrong, Whitworth, & Co. brought forward a modification of the system for heavier guns. In this case the projectile was

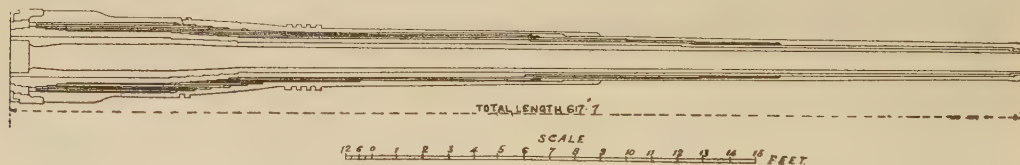


Fig. 13.

loaded separately from the cartridge, but the latter consisted of a charge contained in a brass cartridge-case carrying its own means of ignition (see BREECH-LOADING). In the ordinary breech-loading gun the projectile and charge are loaded separately, and, the breech having been closed, the means of ignition—the tube (see CARTRIDGE)—is put into the vent. In the case of electric tubes, however, the tube in the British service is inserted into the breech-screw before the closing of the breech. The quick-firing system was applied to guns as large as the 6-inch (100-pounder). It gave a considerably increased rate of fire in the smaller natures up to the 4-inch (25-pounder), but very little increase in calibres larger than this; for, as the weight of the projectile becomes larger, the handling of it becomes the governing factor in speed, and the making of guns for ammunition of this class for calibres above 4-inch has been discontinued in the British service (see fig. 15 of a 12-pounder quick-firing gun).

In 1901 'fixed' ammunition similar to that for the 6-pounder and 3-pounder was adopted for the 15-pounder field-gun, and in 1904 for the 18-pounder and 13-pounder guns for field and horse artillery respectively. In the case of horse and field artillery, which must carry into the field every round which they fire, there is a grave disadvantage in fixed ammunition, in that it compels the carriage of an unnecessary load (the brass cartridge) which amounts to some 12 per cent. of the ammunition carried. If some quicker means of inserting the tube into the vent could be devised, so that the service of the gun was not delayed thereby, there would seem to be small excuse for the retention of the brass cartridge.

To return again to the mountings and appurten-

ances of ordnance. In 1890, in order to reduce the strain due to recoil, the 15-pounder field-mounting in the British service had been provided with a top carriage, on which the gun was allowed a short recoil, controlled by a spring buffer, independent of the ordinary recoil on its wheels of the main bottom carriage. In 1897 the French introduced a field-carriage, in which the independent recoil allowed to the top carriage was greatly increased, while the point (rear) of the trail was fixed into the ground by a sort of spade, which embeds itself after the first round fired and checks all further recoil. Extraordinary steadiness and accuracy, coupled with rapidity, of fire were obtained by this combination. As a consequence, however, of fixing the trail in the ground it was necessary to provide independent traversing of the top carriage, and to this has been added further mechanism whereby the laying of the gun for elevation and for line can be effected independently the one of the other, and these operations be carried out by two men. This still further increases the potential rate of fire. Most of the above refinements are to be found in the field-artillery equipments of the leading powers, including, of course, the British. Fig. 14 shows the British 18-pounder gun, carriage, and limber. The buffer is in the long casing above the gun. It has a hydraulic piston to control recoil, and a spring which is compressed during recoil, and thus runs the gun out to the firing position again.

Since the experience of modern war has shown the necessity for the concealment of field-guns, and it is now generally accepted that guns which come into action in the open against a concealed opposing artillery will be rapidly put out of action, provision is made for a 'dial' sight for

laying guns indirectly from behind cover by means of auxiliary aiming points, while observation of fire is carried out by a small party posted where it can see the target and so control the fire. Portable observing-stations, whereby an observer can be raised some 10 feet from the ground, and so look over a crest or undulation behind which the guns are concealed, have also become parts of ordinary equipment. In addition there are the ordinary sights, usually telescopic, for laying by direct vision, though these sights are no longer fixed to the gun itself. From the preceding it will be seen what a very long way the field-artilleryman of to-day has travelled from the standpoint of 1866, when the very simple Armstrong equipment was regarded as unduly complicated.

Heavy field-guns and howitzers are furnished with most of the niceties of the field-guns, and in the case of howitzers, which are usually mounted to be capable of firing at all angles, from about

5° depression to some 70° of elevation, the complications of the carriage are somewhat increased; and in some cases recoil-gear is provided, whereby the resistance of the recoil-buffer is automatically varied to suit the varying force of recoil due to the different elevations.

Turning now to fortress-artillery, the second breech-loading period (1882 to the present time) has witnessed in an extraordinary degree the adoption of elaborate mechanical appliances in the mountings of guns; of delicate electrical appliances for the transmission from observing-stations to the guns of the ranges of objects to be attacked (the ranges being obtained by range-finders, which are as accurately made as the best astronomical instruments), and of 'automatic' sights (first introduced in 1897), which are so designed that if the gun be correctly aimed it will at the same time be given automatically the requisite elevation needed to carry the projectile to the object aimed



Fig. 14.

at. 'Laying' of guns is almost always done by telescopes, whether with automatic or ordinary sights. One of the most remarkable mechanical complications which had a very special vogue in the British service between the years 1884 and 1890 was the 'disappearing' mounting. It may be remarked that this was an old idea revived, for Moncrieff (q.v.) invented a 'disappearing' (counter-weight) mounting as long ago as 1872. On these mountings the gun is carried on hinged arms, by which it is raised so as to be able to fire over a high parapet. On firing, the gun recoils, the arms are driven by the recoiling gun backwards and downwards, and, at the end of their downward course, the arms and gun are held back. During the recoil the arms push a piston into a cylinder containing liquid and air, compressing the latter. The gun having been loaded in the down-position, a valve is opened and the compressed air, expanding, pushes the piston, and by it the arms and gun into the up-position ready for firing again. A considerable number of these mountings, with heavy guns up to 9.2-inch calibre mounted on them, were provided, and a few still exist on certain sea-fronts. Without doubt they fulfil their purpose, which is to expose both the guns and the men working them to a minimum to hostile fire; but they possess a serious drawback, in addition to that of the necessity for the great care required to keep them in working order, in that they necessarily allow of only a slow rate of fire. It is now considered that the occasions when ships will lie off a fortress and attempt to silence or reduce it by artillery fire will be very rare, since such a proceeding argues command of the sea, which would probably enable the force possessing it to land troops and take the surer course of a land investment; and that the occasions when

fortresses with sea-fronts have to fire on ships will be to prevent them slipping past to attack something the fortresses are intended to protect—say a harbour full of shipping, or some important dock-yard. As a result of this change of view, everything is now done to obtain rapidity of fire, the guns being mounted in barbettes, with armoured shields, but with a clear view, and provided with 'automatic' sights (which are also telescopic) and every possible appliance to ensure rapidity of fire. Abroad the mountings are sometimes covered with 'turtle back' shields of hard iron or steel.

In ships of war the present British practice, which is in the main followed by other powers, is to provide battleships and 1st class armoured cruisers with a light quick-firing equipment for repelling attack by torpedo-boats, and a heavy main armament of 12-inch, 13.5-inch, or 15-inch guns for the attack of other warships. The mountings of these heavy guns are even greater miracles of mechanical and electrical ingenuity than those in fortresses, as are the subsidiary appliances for sighting, passing ranges, and judging and correcting the fire from the guns. There are also elaborate arrangements for passing up ammunition from the magazines. Fig. 15 shows an Armstrong-Whitworth naval 12-pounder quick-firing gun on its mounting, which, it may be added, is very similar to that employed for land service.

The course of artillery development abroad has been very similar to that in Great Britain, and the change from smooth-bores to rifled guns took place very nearly at the same time. Only in one respect has Great Britain taken a different course from that pursued elsewhere, in that she reverted to muzzle-loading after adopting breech-loading. In the early adoption of steel, Germany (that is to say, Krupp) took the lead, paying for it at the start with many

burst guns. In wire-gun construction England is at present peculiar; but there are signs that the method is finding favour elsewhere, notably in the United States.

Generally there is a great similarity in the armaments of all the great powers, whether for sea or

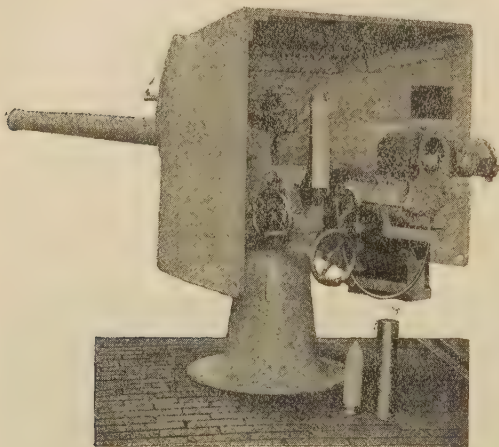


Fig. 15.

land. Fig. 16 shows a Krupp turret-mounting for two 10.9-inch guns, with shield removed, and fig. 17 a 14-pounder Krupp field-gun, carriage, and ammunition-wagon. It will be noticed that this gun is furnished with a 'panorama' sight, which combines the ordinary and dial sights. Fig. 18 shows an 8.2-inch Krupp howitzer, with a self-laying track for moving on soft ground.

The war of 1914-18 has developed no radically new principle in the production of cannon or their mountings, but it has been remarkable for: (1) The enormous increase in the employment of artillery generally, and in the expenditure of ammunition



Fig. 16.

per gun. Prior to it a provision of 2000 rounds per gun for a campaign was considered more than liberal for field-guns, whereas during it a gun often fired this number in the course of a few days. (2) The employment of much heavier guns in the field mounted on mobile mountings, up to 6-inch calibre in the case of guns, and quite normally up to 9.2-inch (with a few 12-inch and 15-inch) in the case of howitzers. This was the practice by all the powers engaged, and with it there was an immense increase of mechanical traction both for the haulage of the guns and ammunition. A few very heavy guns, 9.2-inch and 12-inch, on railway mountings were also provided for special purposes. Owing to the difficulty in concealment from aeroplane observation and the desirability of keeping

guns out of the reach of hostile fire, efforts were universal to obtain the longest possible ranges of which cannon were capable, by increasing the amount of elevation which their mountings could give, and by increasing the length of taper of the points of projectiles to reduce air resistance, and, where the margin of strength of the piece admitted it, increasing the charges fired to give greater muzzle velocities. The object, of course, was to out-range the hostile artillery, so as to inflict damage without suffering it in return. Observation by aeroplane has altered the original practical limitation of range imposed by the extent of vision from the ground necessary to observe and correct



Fig. 17.

the results of fire, and the limit now is practically the extreme to which the guns will carry. An extreme instance of long-range fire was the shelling of Paris, which commenced on the 23d March 1918, by a concealed gun, estimated to be not less than 75 miles away. The essentials to produce such a gun are quite well known, and a good general account of them will be found in 'The Long Range Gun,' a lecture by Major Maitland-Addison, R.A., recorded in vol. xlv., No. 4, of the *Journal of the Royal Artillery*, dated July 1918. (3) The greatly increased use of high-explosive shell instead of shrapnel in field-guns, and the introduction of smoke composition into high-explosive shell to increase the visibility of bursts for observation at long ranges. (4) The introduction of shell filled with smoke composition to produce



Fig. 18.

smoke-screens for protective purposes just prior to attack by infantry. Phosphorus alone is superior to all compositions, but its supply is limited. (5) The introduction of the 'Tank' (a special form of armoured car armed with two light guns) for the attack especially of machine-guns in entrenched positions protected also by wide belts of barbed wire. (6) The introduction of a vast and varied armament for trench warfare (see BOMBS). (7) The introduction of poisonous gases in shell and

bombs, and ejected from cylinders for carriage by wind, and the necessary provision of masks for the protection, more or less efficient (latterly less), of the soldier against this odious weapon, which was Germany's special contribution to the horrors of war. (8) The armament of aircraft with machine-guns for war in the air (though in the later stages of the war aeroplanes regularly fought against troops on the ground), and bombs for attack of objectives both on land and sea. (9) Anti-aircraft armaments, differing only from ordinary quick-firing armaments in the provision of facilities for elevation of the guns to all angles up to the vertical, and special sights to enable rapidly moving objectives to be followed easily anywhere in the field of view. These weapons were often mounted upon platforms propelled by motors for rapid transit, but, for defence of towns, were bolted down to foundations in certain suitable localities. Their projectile was a high-explosive common shell with time or time and percussion fuse, the burst being, however, generally brought about by time action, and exclusively so in the case of the regular defence of towns to prevent a shell, which has failed to burst in the air, from bursting on reaching the ground or striking a house.

Speaking broadly, developments (1) to (7) above were the results of the immense power of resistance of good troops, on the defensive in well-entrenched and well-wired positions, and armed with modern weapons, especially machine-guns. Without the employment of every available means to shake the defender and to protect the attacker, the losses of the latter, even if ultimately victorious, are so prodigious as to be prohibitive unless the defender be not merely forced to retreat, but absolutely routed without hope of reforming for resistance farther back. Even with every assistance at command, the attack must always be very costly. On the whole, it can be said that the above-mentioned developments attained the objects expected; but, as to (8) and (9), while the armament of aircraft (meaning thereby aeroplanes in the main, as airships were latterly used almost entirely for observation, out of proximity to the fighting-line, whether by land or sea, owing to their vulnerability) was quite efficient, it cannot be said that anti-aircraft armaments ever became serious deterrents of aeroplane approach, whether for purposes of observation or attack. Until, by day, the act of obtaining the range of an aeroplane by means of a range-finder (which *can* be done) can be translated automatically and instantly into the correct elevation of the gun and the correct setting of the fuse, and the process becomes as comparatively simple as the aiming of a gun by the ordinary automatic sight supplied to fortress guns well elevated above sea-fronts, it is difficult to see how thorough efficiency can be obtained. On *paper* the solution is quite attainable, but in practice the complications are very great, though probably not prohibitive, except on the score of cost and liability to derangement. It must be remembered in this connection that there is no necessary co-relation between the angle to which a gun must be elevated in order to be aimed at an object in the air and the range of the latter, nor between the height above the ground of the object and its range. When we come to attacks by night by aeroplanes, usually very high up and very difficult to follow by searchlight, the problem becomes still more difficult, and the only possible defence by artillery would seem to be by the 'barrage' of shell burst by time-fuse at different heights in the path which it is hoped the aeroplanes will take. This defence, besides demanding an enormous expenditure of ammunition, has been proved to be inefficient, and does no more than keep the attackers at great altitudes, and so renders

success in bombing definite objectives so extremely difficult of attainment as to be purely a matter of chance. It is needless to add that the possibilities of locating aeroplanes at night by sound have been, and are being, explored, while the suggestions of special shell to destroy them have been innumerable, though hitherto none have been of sufficient value to displace the high-explosive common shell.

Broadly speaking, no nation can ever have anything more than a temporary advantage—due to early initiative—in the quality of its war-stores, though undoubtedly it may have in its power of production in quantity. Guns, mountings, and projectiles are the productions of the designer, the metallurgist, and the engineer, and explosives of the chemist. There is no mystery in the matter, and no monopoly of the skilled professions mentioned is possessed by any nation; and it follows that, once it is known that a nation has a war-store giving certain results, those results can soon be copied in spite of all attempts at secrecy. Similarly, the same limitations to advance usually hold universally. Since the general introduction of smokeless powders (about 1890) the tendency has been to take full advantage of the higher velocities obtainable with them, and to obtain the requisite projectile-energy with guns of smaller calibre, with much higher velocities; and a present limitation is the inability of steel to withstand for an adequate time the tremendous erosion, if high velocities be obtained, using any propellant known at present. This applies especially to the heavy guns, as erosion is largely due to heat, and increases with the weight of charge, and in them the limit of velocity seems at present to have been reached at about 2900 feet per second. In smaller guns erosion is not so bad, and higher velocities might be obtainable; but in these there are other reasons for not exceeding a somewhat similar velocity, even when they are mounted on fixed mountings. In field-guns, whether light or heavy, the velocities are purposely kept as low as possible consistently with obtaining adequate range, owing to the difficulties in checking recoil.

Trustworthy official figures are not available for the latest guns in use by *any* of the great powers, and the table given below is *general*; that is, it may be taken that guns of the *latest* construction in use by any power, of calibres the same (or nearly the same) as those mentioned, will fire projectiles not materially heavier, with velocities not materially greater, than those mentioned. Where velocities much exceeding those given are claimed, without a considerable reduction in the weight of the projectile (below that given in the table for the particular calibre in question) being also admitted, the statement should be regarded with suspicion, as either mistaken or as representing as normal results obtained exceptionally. Velocities of close on 4000 feet per second have been obtained, using projectiles which are abnormally light for the calibre, and velocities with projectiles of normal weight up to 3200 feet per second are frequently obtained in proof of guns; but neither of these represent service conditions. The object of heavy guns is to strike heavy blows, with projectiles containing adequate bursting-charges up to the extreme range to which the gun will carry; of *all* guns to carry projectiles with as heavy bursting-charges (or content of bullets in the case of shrapnel) as the conditions will permit; and it is difficult to conceive circumstances in which it would be worth sacrificing weight of projectile in order to attain velocity (see the article on Rifles as to the relation of weight to diameter in projectiles, which applies to cannon also). The modern tendency is somewhat in the contrary direction—i.e. to increase calibres and weights of projectile, and decrease velocities and so avoid erosion; and in this the United States took

the lead. See also SHELL, SHOT, CARTRIDGE, BREECH-LOADING, and FUSE.

N.B.—It will frequently be found that the velocities habitually used are much lower than those given in the table for naval and fortress guns, as the latter represent approximately the highest practically obtainable, *not necessarily those actually used*. With field-guns (both light and heavy) and with howitzers the velocities are always much lower than might be used if recoil troubles had not to be considered.

NAVAL AND FORTRESS GUNS.

Inches.	Calibre. Centimetres.	Weight of Projectile in lbs. (about).	Muzzle-velocity in ft. secs. (about).
18 *	46	2900	2500
16	41	2200	2500
15 *	37.5	2000	2500
14 *	35	1600	2500
13.5 *	34	1400	2500
12 *	30.5	850 to 1000	2900 to 2800
10.9	28	600 to 700	2900 to 2800
9.4	24	380 to 480	3000 to 2900
9.2 *	23	380	2900
7.5 *	19	200	2900

QUICK-FIRING GUNS.

6 *	15	100	2900
4.7 *	12	45	2900
4 *	10	25	2900
3 *	7.7	12 to 15	2900 to 2700
2.24 *	5.7	6	2900
1.85 *	4.7	3	2900

HEAVY FIELD-GUNS.

5 *	12.8	60	1700 to 2000
4.7 *	12	45	Do.
4 *	10	30	Do.

LIGHT FIELD-GUNS.†

3.3 *	9	18	1600
2.95 to 3 *	7.5 to 7.7	12 to 16	1600 to 1900

MOUNTAIN-GUNS.‡

2.5 * to 2.75 *	6.4 to 7	7 to 12	1200 to 1400
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HOWITZERS:

HEAVY SIEGE.

10.9	28	500	} Charges giving velocities from 400 to 1100 foot-seconds.
9.4 *	24	280	
8.4	21.5	250	
8.2	21	230	
6 *	15	120	

HEAVY FIELD.

6	15	90 to 100	Do.
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LIGHT FIELD.

5 *	13	50	} Do.
4.7	12	46	
4.5 *	11.5	35 to 40	

* Calibres in the British service.

† With field and mountain guns a lower velocity does not necessarily correspond with a larger shell.

‡ In two parts, each not exceeding 250 lb. in weight, so as to form a suitable mule-load.

Cannon, JOSEPH GURNEY, wielder of great power as Speaker of the House of Representatives in the 58th, 59th, 60th, and 61st Congresses of the United States (1903-11), was born 7th May 1836 at Guilford, North Carolina. He was admitted to the Illinois bar in 1858. From 1873 (with short intervals) he has represented Illinois districts as a republican.

Cannon-ball Tree (*Couroupita guianensis*), a large tree of Guiana, one of the Lecythidaceae, bearing a large and fragrant woody fruit.

Cannon Bone. See FOOT, HORSE.

Cannstatt, in Württemberg, was in 1904 incorporated with Stuttgart.

Cannula, a small tube used in surgery; especially a tube enclosing a *trocar*, or perforator (withdrawn after it has effected the introduction of the tube), used for evacuating air or fluid from any cavity in the body; and the tube for the patient to breathe through, inserted into the windpipe after the operation of Tracheotomy (q.v.).

Cano, ALONSO, a Spanish painter, born at Granada in 1601, received his first instructions in the principles of art from his father, who was an

architect, and attained celebrity so early that in 1638 or 1639 he was appointed court painter and architect to the king. Cano was of a hasty temper, and was accused of having murdered his wife in a fit of jealousy, but the accusation appears to have been quite groundless. He was subjected to the torture; but no confession having been elicited, he was acquitted, and received again into the royal favour, named residentiary of Granada, and spent his last years in acts of devotion and charity. He died 3d October 1667. In Fuseli's opinion, he excelled all his contemporaries except Velasquez. His eminence in the three departments of the fine arts—sculpture, painting, and architecture—obtained for him the hyperbolic title of the 'Spanish Michelangelo.' His pictures, marked by graceful design and pleasing colouring, are very numerous, and are preserved in Granada, Seville, Madrid, Málaga, and other Spanish cities.

Cano, JUAN SEBASTIÁN DEL, the first circumnavigator, was born at Guetaria, on the Bay of Biscay. In 1519 he sailed with Magellan (q.v.), and, after his death, safely navigated the *Victoria* home to Spain, 6th September 1522. He died in a second expedition, 4th August 1526.

Cano, LEOPOLDO, Spanish dramatic poet, was born at Valladolid in 1844.

Cano, MELCHOR, Spanish Dominican theologian, was professor at Salamanca, attended the Council of Trent, opposed the Jesuits and the papal power in Spain, and was consecrated Bishop of the Canaries. He died in 1560. His most famous book is *De Locis Theologicis* (1563).

Canobus. See CANOPUS, ABOUKIR.

Canoe (from a Caribbean word through the Span. *canoa*), originally, a light narrow boat, made of the hollowed stem of a tree or of bark, and propelled by paddles. The Neolithic canoes of Britain and many of those in use among primitive peoples to-day are 'dug-outs,' being simply stems of trees hollowed by stone implements, shells, or fire, and then shaped, and often sharpened at either end. The Canadian birch-bark canoe is a light, buoyant, frail-looking, but serviceable boat. In building it a skeleton is made of light wood,

the casing of birch-bark is put on transversely, with the broadest strips amidships, and sewn together with the fibrous roots of fir-trees, while the seams are dressed with gum. It has no keel, and neither stem nor stern, but runs to a point at each end; and neither nails nor pegs are used in its construction. The outer skin of the 'Canadian' canoes, so popular on the Thames, is made of alternate strips of light and dark hard-grained woods, $\frac{1}{8}$ inch thick, grooved, bound, and glued together; a layer of broader strips, placed crosswise, forms the inner skin. The timber used is steamed and bent when moist on to a mould the exact size of the proposed canoe. The birch-bark canoes of South America and the Australian gum-tree bark canoe are made of one piece of bark. For Eskimo Kayak, see ESKIMO. Many of the Polynesian canoes are hollowed out of a single log; others are of planks cunningly fastened together, and fitted with outriggers. The



Canadian Trapper's Canoe.

largest Fiji canoes are 100 feet long, and the double ones—with deck placed between them—of 70 feet can carry from 40 to 50 persons. Those of the Solomon Islands have a palette-shaped sail made of a mat. On the inland African lakes some are made of reeds. See CATAMARAN, CORACLE, PROA, &c. Modern British canoes are usually constructed of oak, cedar, or pine. The revival of British canoeing is due to the achievements of John MacGregor (q.v.), whose *Rob Roy* canoe for navigating eastern waters was 14 feet long, 26 inches wide, with a 7-foot paddle; and its weight, including paddles, masts, and sails, was 72 lb. It was of oak below, decked with cedar, and had an apron of white waterproof. A few years later Tredwen and Baden-Powell's *Pearl* and *Nautilus* canoes had both the head of the boat raised and its shoulder broadened; and the modern cruising canoes are on an average 15 feet long, with a 30-inch beam; they are mostly fitted with two larger sails, and, with a metal centre-board and deep rudder, can sail as close to the wind, when tacking, as a yacht. American inventors passed from the stationary deck seat (1882) to the sliding seat (1886), and from various elaborations in reefing and lowering sails to standing sails that cannot be lowered or reefed; the cockpit was even reduced to a mere depression in the deck 6 inches deep. The modern canoe, in spite of its great sail area, will ride out open boats many times its size.

See MacGregor, *A Thousand Miles in the Rob Roy Canoe*, and *Rob Roy on the Baltic, Jordan, and Zuyder Zee*; Baden-Powell, *Canoe Travelling* (1871); Inwards, *Cruise of the Ringleader*; R. L. Stevenson, *Inland Voyage*; Holding, *Cruise of the Osprey* (1878) and *Watery Wanderings* (1886); Vaux, *Canoe Handling* (N.Y. 1888); Stephens, *Canoe and Boat Building* (N.Y. 1891); *Canoeing and Camping Out* (London, 1893); J. D. Hayward, *Canoeing with Sail and Paddle* (1890-93).

Canon, a word originally Greek (*kanōn*), signifying a straight staff used as a measuring-rod, is applied in various arts and sciences to what serves for a rule or standard. From this general sense, which it bears, e.g., in Galatians, vi. 16, the word by the middle of the 3d century had come to mean the type of Christian doctrine recognised as orthodox by the Catholic Church, and afterwards was particularly employed to designate collectively the Scriptures which were accepted by the Christian church as the standard or rule of faith. The first instances of the latter meaning are found in the 59th canon of the Council of Laodicea (363 A.D.), and in the *Epistola festalis* of Athanasius. A book accepted by the church into the canon is accordingly canonical; and its canonicity is the complex of the very various qualities which have led the Christian churches so to accept it. The canon of the Old and New Testaments is discussed at BIBLE (and cf. APOCRYPHA). The word canon is also sometimes used to signify a list (e.g. that of the clergy at the Council of Nicæa in 325), and in this sense it is still used to denote the catalogue or register of Catholic saints. The use of the plural form to denote church precepts occurs about 300, and it begins to be specially transferred to the decrees of church councils about the middle of the 4th century (see CANON LAW). The Canon of the Mass (see LITURGY) is the portion included between the Preface and the Pater, the rule for the eucharist in the Roman Catholic Church, and including the prayer of consecration and the words whose use is believed to alter the bread and wine into the veritable body of Christ. For the Apostolic Canons, see APOSTOLIC CONSTITUTIONS; for the Canons of the Church of England, see under that head; for those introduced into the Scottish Church in 1635, see CANONS (BOOK OF).

Canon (Lat. *canonicus*), an ecclesiastical dignitary (so called as living under a rule, or as following the rule or canon of divine service, or again, most probably, as inscribed on the canon or roll of ecclesiastical officers) holding a prebend in a cathedral or collegiate church. His office is of no great antiquity. According to Pasquier, canons are mainly divided into Canons Regular and Canons Secular. This, however, is not precisely true, for the term canon was applied in the 4th century to cenobites living under a common rule; and the office of canon is supposed by some antiquaries to have been introduced by Baudin or Baldwin, Archbishop of Tours (546-52) under Clothaire I., but was more probably first instituted by Chrodegand, or Chrodegang, Bishop of Metz, in 763. It is at least certain that he was the author of the oldest canonical rule, which was simply an adaptation of the monastic rule commonly but erroneously attributed to St Augustine, to the priests and 'clerks' specially attached to the service of a cathedral or other church, but differing therefrom chiefly by omitting the vow of poverty, and allowing canons to retain a life-interest in private property. It enjoined on the canons manual labour, the practice of silence at certain times, confession twice a year, and other duties needless to specify. The canons formed the council of the bishop, and assisted him in the government of his diocese. They lived in a house called a monastery, slept in a common room, ate at the same table, and were originally supported out of the episcopal revenues. This institute was encouraged by Charlemagne, under whom provisions concerning it were enacted at the Councils of Aix-la-Chapelle in 788, and Mentz in 813. In 816 Louis the Pious induced the Council of Aix-la-Chapelle to draw up a general rule of 147 articles for the whole body of canons. Canons found their way not long afterwards into England, Scotland, and Ireland. Various reforms of canons were made in the 11th and beginning of the 12th century, notably the institution for the canons regular of rules for community of life and abolition of private property imposed by Pope Nicolas II. in 1059, and by Alexander II. in 1063, and the foundation of the Austin canons by Gervase, Archbishop of Rheims, in 1067, followed up by Ivo, Bishop of Chartres (1090-1115). Although the so-called rule of St Augustine was adopted in various places, it was not till 1139 that Innocent II. decreed, and the Council of Lateran, that all canons regular should be bound by that rule, and from that time they took generally the title of canons regular of St Augustine, or Austin Canons (see AUGUSTINIANS). They were further dealt with in a reform enforced by a bull of Benedict XII. in 1339. Gradually, however, many began to emancipate themselves from the restrictions of monastic life, and to live independent of any rule, which is not at all surprising, for the canons were wont to keep apart from the 'lower clergy,' as they called parish priests and others who really laboured to impart religious instruction. They were often of noble families, loved titles—at Lyons, one of the 'noble chapters,' every member of which had to prove several descents of nobility in the case of both his parents, they were called *counts*—and in general were men of the world rather than true churchmen. Most of these reformed or remodelled canons were called Black Canons, from wearing a black cassock; others, White Canons, from wearing a white habit, like the *Premonstratenses* of Picardy in France, and the canons of St Victor at Paris and Marseilles. In England, while there is some ground for holding that the clergy established by Augustine at the church of Canterbury were rather canons regular than monks, there is no positive evidence of the

introduction of canons regular till the beginning of the 12th century, when they appear at Gloucester, and somewhat later in London. They were reformed by Cardinal Wolsey in 1519, in virtue of a bull of Leo X., but shared in the general fall of monastic institutions in 1539. The class of *secular* canons, whose manner of life was not conventual, and who therefore escaped destruction in England when the monasteries were abolished by Henry VIII., probably originated in a tendency to relax the severity of rule enjoined on the regulars, which indeed was hardly less stringent than in the case of ordinary monks. Secular canons still exist in the Anglican Church, and their duties—making allowance for the difference between the Roman Catholic and Anglican religions—are much the same in kind as they were before the Reformation. For Minor Canons, see CATHEDRAL.

Canon, in Music (from the Gr. *kanōn*, 'a rule'), is the species of Imitation (q.v.) most strictly according to rule. The melody given out by one part is repeated note for note by the successive parts which follow at any interval of time and position in the scale. When produced between two parts it is called 'two in one,' when between three, 'three in one,' at the octave, fifth, or any other interval. Two or more canons may be carried on simultaneously; a piece for eight parts, consisting of four canons each between two voices heard simultaneously, is termed a canon 'eight in four.' Other parts may be heard, not in imitation, along with those in canon. The imitation may also be made by means of the devices of inversion, diminution, augmentation, retrogression, &c. The latter is termed a canon 'cancrizans,' from its crab-like motion. When a canon terminates by a few notes not in imitation, forming a cadence, it is called finite; but when it returns again to the commencement it becomes 'circular,' or 'infinite.' Canons are found in both instrumental and vocal works, and composers of all ages have shown their skill in constructing them. They abound in the works of the older writers, and occasionally considerable works were constructed wholly in canon—e.g. a Mass by Alessandro Scarlatti. Frequently they were more curious and enigmatical than beautiful; in modern music they appear in their proper aspect as incidental, or as merely an ingenious play upon notes. Byrd's well-known *Non nobis Domine* may be referred to as a specimen of canon. A full treatment of the subject will be found in the works upon counterpoint and fugue by Marpurg, Cherubini, or Ouseley.

Cañon (sometimes spelt *canyon*; Span. 'a cannon,' 'tube,' 'gorge'), the name given in western North America to a deep gorge or river ravine, between high precipitous cliffs. One of the best examples is the far-famed cañon of the Colorado (q.v.); see also SNAKE RIVER.

Canoness (*canonica*). The title of canoness was given at the close of the 8th century to a class of women living in common under a somewhat laxer rule than that of nuns, and originating in the Frank empire in imitation of the chapters of canons then recently instituted. They took the vows of chastity and obedience, but not that of poverty, and were not cloistered, though they had a common table and dormitory, and were bound to the recitation of the breviary, as were nuns. Their occupations were chiefly education of girls, transcription and embellishment of church office-books, and embroidery of vestments. The advantages of such institutions as asylums in a rough age were soon visible, and they multiplied in consequence, but as in many houses the religious motive had little to do with entrance, a distinction was drawn ere long between canonesses

regular and secular. The secular canonesses were for the most part members of princely or noble families, practised much state and luxury, and retained none of the rule save the common dormitory and the recitation of the Hours in choir. In Germany, several abbesses of canonesses were princesses of the empire, kept up feudal state, and furnished contingents to the imperial army from their vassals; and at the Reformation some chapters adopted the new opinions, and subsist to the present day as Protestant foundations, enjoying the revenues, and admitting to membership only ladies of noble birth or daughters of distinguished members of the military and civil services, whose sole obligation is celibacy during membership.

Canonical Hours are the hours of day and night fixed for the reciting or chanting of the several parts of the divine office in the Church of Rome, but they are no longer strictly adhered to except in certain monastic orders. See BREVIARY. In England the phrase is also used for those hours (now 8 A.M. to 3 P.M.) in which a marriage can be performed in a parish church.

Canonicals, a term used to describe the proper ecclesiastical dress of the clergy. See VESTMENTS.

Canonisation in the Roman Catholic Church is a solemn act by which the pope publicly proclaims the sanctity of a servant of God, whom he thereupon proposes to the veneration and *cultus* of the universal church. As a rule it is the final act of a lengthy juridical process, of which a former stage has been completed by the decree of Beatification (q.v.). To obtain this preliminary honour, the reputed saint must pass a strict examination of his virtues, and give proof of his performance of miracles. The decree of beatification declares him to be among the citizens of heaven, and accords him the title of Blessed, but the *cultus*, including the celebration of his feast-day, proper offices in missal and breviary, and the public veneration of his image or relics, is permitted only in a specified country, diocese, or religious order. Canonisation, which follows only on evidence being produced of fresh miracles performed by the *Beatus*, gives him the full title of Saint, and enjoins his *cultus* upon the whole church.

This formal grant of a heavenly rank and dignity to a deceased person has an analogy with the *Apotheosis* (q.v.) of ancient Rome. In the primitive Christian church the germs of the modern custom are to be found in the honours publicly paid to the martyrs. Altars were set up at their tombs, the anniversaries of their triumphs were celebrated with religious rites, and their names commemorated in the liturgy. Similar honours came shortly to be bestowed on the confessors or those who suffered imprisonment or pains short of actual martyrdom for their faith; and finally, when the days of persecution were over, the status of a confessor and the title of saint were extended to all who died with a reputation for eminent sanctity or for the working of miracles, which was taken as an almost infallible token of sanctity. For many centuries the appellation of saint was given to individuals, as it were, by popular acclamation. Martyrologies, menologies, calendars, and the like, were composed, which gave with more or less discernment and authority the names of the generally acknowledged saints, while it would fall to the bishop to decide to whom he should assign a feast-day or ritual commemoration within the limits of his own jurisdiction. Grave mistakes were admittedly made. Thus, St Martin of Tours is said to have miraculously discovered that a pretended martyr much honoured in his diocese, and over whose tomb the bishop had erected an altar, was no other than a

robber executed for his crimes. Legendary 'acts,' migrating from country to country, were a frequent source of confusion, a curious instance of which may be found in the story of Barlaam and Josaphat (q.v.), which has procured a place in the Roman martyrology for the pious memory of Buddha.

It was not until a comparatively late period that a regular form of procedure equivalent to canonisation was adopted. Application had, indeed, in early times been made to Rome for sanction of the cultus of some holy person, as in the case of Vigilius, Bishop of Trent, said to have been martyred in the first decade of the 5th century. But the earliest acknowledged instance of a solemn decree of canonisation is that of Udalric or Ulric, Bishop of Augsburg, declared to be a saint by John XVI. in 993 A.D. A little short of two hundred years later (1170 A.D.) Alexander III. reserved the right of canonising exclusively to the Holy See, and made it unlawful to render public cultus to any person, however celebrated for miracles, without the sanction of the pope. There had apparently been some ground for the decree; for in the pontificate of this same Alexander, the monks of a certain convent had publicly venerated as a saint a member of their community, who, in a fit of drunkenness, had been beaten to death by his religious brethren. The new rules were, however, not strictly observed, and abuses continued. Urban VIII., in two constitutions, 1625 and 1634, made more stringent regulations, and laid down the procedure in cases of canonisation, which, with slight modifications, is in force at the present day. It was strictly forbidden to give any public honour whatever to a reputed saint, to exhibit his picture in church, or even to apply to such a one the title of 'saint,' without explanation. The pope, however, declared that he did not thereby intend to prejudice the case of those who had received immemorial cultus through the general consent of the church, or whose cultus had obtained any special sanction from his predecessors. The exception is important.

Canonisation, without a special dispensation, cannot be decreed until fifty years have elapsed since the decease of the claimant for the honour. The process which precedes the decree observes all the forms of a suit at law. Two things must be established by competent witnesses—eminent virtues, technically called virtues in an 'heroic degree,' and the performance of miracles. The virtues, however heroic, will not be enough without miracles, and the miracles, however numerous and extraordinary, will not suffice without heroic virtue. In the case of the martyrs only, the requirements under the head of virtue are naturally less rigorous, all that is needed being proof of certain dispositions regarded as a proper preparation for true martyrdom. The first step is taken in the country or diocese of the servant of God by the ordinary, who sets up his court and examines witnesses, who speak, not now of virtues in particular, nor in proof of definite miracles, but of the existence of *fama*, or a reputation for sanctity. The bishop, or his vicar-general with assessors, sits as judge. The postulator selects and summons the witnesses in favour of the cause. An official corresponding to the *promotor fidei*, or the 'devil's advocate,' at Rome, watches the case to see that all the forms of the law are strictly observed, and a notary takes down the evidence, which, with all the documents 'compulsed' or put into court, is transmitted to Rome, to be there laid before the Congregation of Rites, whose business it is to sift and examine the evidence; and finally, but not until the expiration of ten years, report to the pope.

It is not necessary to describe the several stages

through which the process is conducted. If the promoter of the faith is satisfied, the pope takes the cause into his own hands, issues remissorial letters to a committee of the Congregation of Rites, which will then have to examine the virtues and miracles specifically. The cause is now said to be 'introduced.' So far the juridical decision is equivalent to the finding of a grand jury that there is ground for sending the case to trial. The introduction of the cause—i.e. of the pontifical process, entitles the *beatificandus* to be called Venerable. Very many have attained to this point in the proceedings, and no further. The legal expenses are considerable; and apart from the merits of the candidate, the motive power, such as the patronage of princes or the influence of a powerful religious order, is often wanting. If, however, the candidate passes successfully through the ordeal of the pontifical process, a decree of beatification is pronounced, and a festival-day, with proper office and the annexed privileges, is conceded to a specified locality or community, beyond which the cultus must on no account be extended. Before the further process of canonisation can be instituted, as has been said, the *beatus* must have worked a certain number of miracles since his beatification, and if these are such as can be brought into court, the case once more passes through the hands of several congregations, the last of which is held in presence of the pope, when the final decree is drawn up and agreed upon.

The ceremony of canonisation takes place in the Vatican basilica, and is one of the most solemn and imposing of all papal functions. It opens with a grand procession of pope and cardinals, with the image of the saint borne on banners. The pope then takes his seat on the throne, surrounded with his court. The postulator of the cause, generally a person of high rank, is led to the steps of the throne, and there petitions that the blessed servant of God may be enrolled in the catalogue of saints. The pope replies that so grave a matter requires light and counsel from heaven. The litanies are thereupon chanted, and the demand of the postulator renewed. Again the pope requires to ascertain the will of God by prayer, and the *Veni Creator* is sung. After a third request the pope announces that the *beatus* is enrolled in the canon of the saints, and that his memory is to be celebrated on a certain day throughout the church. Other ceremonies follow, with a high mass, at which the pope officiates, and at which the several cardinals concerned present mystical offerings, ornamented candles of wax, turtle doves and other live birds in gold and silver cages, costly flagons of wine, &c.

It must not be supposed that these lengthy juridical proceedings and ceremonies take place on all occasions of papal canonisation. For, besides what is called the formal canonisation, there is another process called equipollent or equivalent canonisation. This is founded upon the before-mentioned exceptions of Urban VIII.—i.e. upon proof of immemorial cultus, or of some papal sanction given to cultus prior to the date of Urban's constitution. In such cases the pope may at once pronounce the decree. Equipollent beatification is a summary process of a similar kind. The pope accepts the results of the ordinary process, and at once decrees beatification.

Equipollent beatification and the earlier stages of the process may be illustrated by the case of the English martyrs of the 16th and 17th centuries, which possesses some interest as being the first instance of the introduction of a cause relating to any English-speaking person since the Reformation. On 19th June 1874 Cardinal Manning instituted the ordinary process in due form. He

delegated three judges, who held their sessions at the London Oratory. Father Morris, S.J., acted as postulator, and summoned Bishop Hedley, Father Stevenson, the Duke of Norfolk, and others, as historical experts, to give evidence on oath in answer to written interrogatories. They testified to the cause of martyrdom, the character of the martyrs, and the tradition of miracles wrought at their intercession or by touch of their relics. There is no cross-examination, nor are unfavourable witnesses called. The proceedings, with extracts from books and MSS., were carried to Rome, where for more than the requisite ten years the case remained to be slowly digested by the officials of the Congregation of Rites. The promoter of the faith made the usual objections, found that such a one had died a natural death in prison, or that religion could not be said to be the cause of the execution of another. Meanwhile attempts were made by the postulators to escape from the difficulties of the tedious process before them, by finding ground upon which the pope could by indult grant equipollent beatification. Such a ground was at last discovered in the pictures of the martyrs under Henry VIII. and Elizabeth, painted on the walls of the English College at Rome in 1582, by sanction of Gregory XIII., and thereby giving proof of papal authority for public veneration of these martyrs. The 'devil's advocate' was satisfied, and accordingly the fifty-four martyrs here represented were declared Blessed in a decree issued December 29, 1886. The cause of 261 was 'introduced,' and these are therefore entitled to be styled Venerable Servants of God. Against thirty-three whose names were sent up to Rome by Cardinal Manning, including Henry Garnet the Jesuit, the objections of the promoter so far prevailed that their cause was deferred.

The case affords a curious illustration of the weak points in the procedure. The list of these English martyrs transmitted to Rome in the first instance followed that of the cautious Bishop Challoner, and therefore excluded many doubtful claimants who had appeared in some earlier and less authentic catalogues. Little was known, for example, of the priest Plumtree, who acted as chaplain for the northern earls in the rising of 1569, and was hanged as a rebel at Durham. Few writers ventured to reckon him as a martyr for religion. But his execution was represented in Circiniani's pictures, and therefore, notwithstanding the lack of historical evidence or even of continued tradition, he becomes suddenly, on the strength of this papal privilege, without proof of miracles, promoted *per saltum* to the full honours of beatification.

It remains to be said that Roman theologians commonly hold the decree of canonisation to be infallible, on the ground that otherwise the church might hold up to the veneration and imitation of the faithful a lost soul. It is said to be more doubtful if beatification is also infallible, for although the decree publicly declares the deceased person to be among the blessed, his cultus is permitted rather than enjoined, and that not for the universal church, but, as has been said, for a limited district or community.

The chief authority on canonisation is the great work of Cardinal Lambertini, afterwards Benedict XIV., whose three folio volumes, *De Beatificatione et Canonizatione Sanctorum*, are a storehouse of information not only on the legal procedure, but on the phenomena of ecstasies, visions, raptures, bilocations, and the miraculous healing of the sick and raising of the dead. A good summary of the subject may be read in Ferraris' *Prompta Bibliotheca* (article *Cultus*

Sanctorum). A portion of Benedict XIV.'s treatise relating to *Heroic Virtue* was translated in 1850 into English under that title by the Fathers of the Oratory. See SAINT.

Canon Law (*jus canonicum*) is, strictly speaking, that part only of ecclesiastical legislation in and by synods of spiritual persons which is concerned with the moral and disciplinary government of the Christian church, and is embodied in the form of *canons* or rules. It is thus distinct alike from the dogmatic decisions of similar synods, embodied in *decrees*, affecting formularies and standards of doctrine; from papal law (*jus pontificium*); and from enactments of the civil power upon ecclesiastical subjects (*jus ecclesiasticum*), though the last often overlaps the canon law proper. The earliest example of the enactment of such laws is in Acts, xv. 6-29, when the council of apostles and elders at Jerusalem framed rules of discipline for the new Gentile converts. It was not until the conversion of the empire, however, that it was feasible for canons of synods to have more than local currency and merely consensual force. From that time two new factors enter into the evolution of canon law—the general councils, which either themselves enact canons to bind all Christendom, or give their sanction to those enacted by local synods, thereby similarly extending their scope; and the sanction of the civil power, validating church canons so as to give them legal force and coercive authority.

Canon Law is broadly divided into Eastern and Western. The canon law of the Eastern Church is a comparatively brief code, composed exclusively of few, homogeneous, ancient, and authentic materials, and has remained unaffected by change or accretion for a thousand years. It consists of the following matters: (1) The disciplinary canons of the seven councils recognised as œcumenical by the Græco-Russian Church—namely, Nice I., Constantinople I., Ephesus, Chalcedon, Constantinople II. and III., Quinisext in Trullo (accounted by the Easterns as supplementary to the fifth and sixth œcumenical councils, and therefore not separately reckoned), and Nice II.; (2) the ancient code of laws known as 'Apostolical Canons'; (3) the canons of various lesser synods, Eastern and African, accepted and sanctioned by one or other of the greater synods; (4) canons promulgated by Dionysius and Peter of Alexandria, Gregory Thaumaturgus, Athanasius, Basil the Great, Gregory of Nyssa, Theophilus and Cyril of Alexandria, and canonical epistles of Gennadius and Tarasius of Constantinople; (5) the comments and glosses thereupon of the 12th-century canonists Theodore Balsamon, Joannes Zonaras, and Alexius Aristenus, which, though not properly part of the body of law, have been usually treated as authoritative interpretations. The earliest attempt at codifying the Eastern laws (there were various partial collections made previously) was the *Syntagma Canonum* or *Nomocanon*, compiled in the 6th century by John the Scholastic; the final one was the *Nomocanon* of Photius, patriarch of Constantinople, compiled about 880 A.D. All the main documents of this Eastern code are to be found in the *Synodikon* or *Pandectæ* of Bishop Beveridge (2 vols. folio, Oxford, 1672-82). The civil validation of the Eastern canon law was first effected by Novel cxxxi. of the emperor Justinian.

The Western canon law is of much greater extent, is composed of much more diversified materials, inclusive of a large element of papal law, and has undergone continual changes by means of successive accretions and interpolations, many of the latter being spurious, besides being further complicated by the codes of canons enacted by national churches, and having local currency

only, but co-ordinate with the main Latin code in the several territories within which they are or were in use.

The earliest full collection of canons received in the West was made almost contemporaneously with the earliest Eastern one, and is due to Dionysius Exiguus, a Seythian monk of the 6th century, who translated the Greek portion of his materials into Latin, and issued (*circa* 550 A.D.) the whole in a body of 401 canons, being those of the Apostles, Nice I., Ancyra, Neocasarea, Gangra, Antioch, Laodicea, Constantinople I., and Chalcedon, the so-called canons of Sardica, and the African code of 138 canons. To these he added further all the decretal epistles of popes with which he was acquainted, beginning with Siricius in 385, and ending with Anastasius II. in 496, thus discrediting in advance the long subsequent forgery of the False Decretals, which professedly went back much earlier. This collection was adopted at Rome, and received there its first accretions in the decretals of popes later than the time of Dionysius, down to Gregory II. (715-31). It was this co-ordination of papal epistles and rescripts with the canons of councils, as holding equal rank and authority, which was the distinguishing feature of the compilation by Dionysius, thus winning it that acceptance at Rome which was never accorded to the nearly simultaneous *Breviatio Canonum* by Ferrandus of Carthage (547). In its augmented shape, the Dionysian collection was formally recognised as the canon law of the Roman Church, and not merely was tacitly received as such in Western Europe and in Africa, but was sent officially by Pope Hadrian I. to Charlemagne, and solemnly received by the great synod of Aix-la-Chapelle in 803, whence it bore for a time the name of *Codex Hadrianus*. It was similarly recommended to the English bishops by Leo IV. about forty years later. Its fortunes in Spain were even more noticeable and momentous. Adopted there by (or at least in the time of) Isidore of Seville, and published under his name, it speedily supplanted an earlier collection by Martin of Braga, and prepared the way for the great forgery known as the False Decretals, possibly fabricated in Western Gaul, but published in Spain about 845 by Isidore Mercator, and easily passing, through the coincidence of editorial name, into the earlier and genuine Isidorian code. These false decretals consist of about one hundred spurious documents, inclusive of alleged papal rescripts, from Clement I. in the 1st century, to Sylvester in the 4th, and containing also the pretended Donation of Constantine. Nicolas I., then pope, saw how advantageous to himself this testimony must prove, and hastened to give it recognition, causing it to be embodied in the body of Roman canon law, wherein (despite the universal modern admission of its spuriousness) it continues to form a large and influential factor. The simple fact that search in the Roman archives must at once have established the non-existence of the whole collection, brands Nicolas with acting in conscious bad faith, whereas it is possible that the other persons then concerned in giving circulation to it may have been more or less honestly deceived.

The next important stage in the evolution of the canon law was the *Decretum* of Burchard of Worms in 1025, after which came the collections of Anselm of Lucca and Cardinal Deusdedit, about 1086, much increasing the papal factor. Soon followed the collection made by Ivo, Bishop of Chartres, about 1114. He seems to have taken the earlier work of Burchard of Worms, largely citing the False Decretals, and long current in Germany, as his model and guide, for his *Decretum* follows its method closely, and often

adopts its very words. All these collections, however, had one common defect as legal codes. The canons they contained, passed by councils widely apart in time, place, and circumstances, were often conflicting and contradictory, and thus perplexing rather than instructing those who consulted them for practical guidance. To meet this difficulty, Gratian, a Benedictine monk of Italian birth, and professed in a monastery at Bologna, compiled, between 1139 and 1142, a *Concordia discordantium Canonum*, published at Rome in 1144, for the purpose of showing how the opposing provisions could be reconciled; and this work (commonly cited as the *Decretum Gratiani*) met with immediate success, and exercised a powerful influence on the interpretation of the canon law. He appears to have taken the idea from the Pandects of Justinian, then recently discovered, and brought his collection down from the time of Constantine the Great to the pontificate of his contemporary, Pope Eugenius III., who approved it, and is alleged (but on insufficient evidence) to have at once licensed it to be read in the law-schools, and accepted as authoritative. Whether it obtained this special sanction or not, at any rate it did make its way into the law-schools, and enjoyed a dominating influence therein. It included the False Decretals, and no fewer than 367 spurious canons, and thus powerfully contributed to the falsification of the Western code. To this period belongs the term '*Jus Canonicum*' itself, not found earlier, and having no Greek equivalent. A further collection of the growing mass of fresh decretals needed to be made, and this was first undertaken by Bernardo Circa, Bishop of Faenza, who brought them down to the pontificate of Celestine III. (1191-98). But this collection was superseded by that formed at the instance of Pope Gregory IX. by his chaplain, Raymond de Pennaforte (afterwards general of the Dominicans, and canonised), about the year 1234. This body of documents forms that portion of the *Corpus Juris Canonici* entitled *Decretales Gregorii Papae IX.*, comprised in five books. To these were added a sixth by Boniface VIII. in 1298, known as *Sextus Decretalium*, or more briefly, the *Sext*. The next addition was the *Clementina*, or constitutions promulgated by Pope Clement V. at the Council of Vienne in 1308, and republished by his successor, John XXII., in 1317, who subjoined thereto twenty fresh enactments of his own entitled *Extravagantes Joannis*. Five books of still more recent documents, named *Extravagantes Communes*, coming down to 1483, in the pontificate of Sixtus IV., have further been embodied in the code; and the whole of these materials are collectively styled *Corpus Juris Canonici*, of which a corrected and standard edition was published by order of Pope Gregory XIII. But the word 'corrected' does not denote rejection of the spurious factors. The False Decretals, though called in question even before the Reformation by Nicolas of Cusa (1401-64) and Cardinal Torquemada (1388-1468), powerfully controverted by the Magdeburg Continuators (1560-74), and finally discredited by David Blondel in his *Pseudo-Isidorus et Turrianus Vulgantes* (Geneva, 1628), constitute an important element of the contents. Codification of canon law was set on foot by Pius X., who appointed a commission for the purpose. Cardinal Gasparri was especially active in the work. The *Codex* was promulgated by Benedict XV. in 1917.

The various parts of Western Europe had their local canon law derived from national synods and similar sources. Thus, in the empire, the Capitularies of Charlemagne and his successors contributed largely to the ecclesiastical law of Germany; and several collections of these (analogous to the Italian collec-

tions of papal decretals) were made from time to time, beginning with that of Angesisus, Abbot of Fontenelle, in 827, recast and much enlarged by Benedict of Mainz twenty years later; and a collection passing under the name of Angilram or Ingelram, Archbishop of Metz, Charlemagne's chaplain and almoner, is noticeable as containing large extracts from the False Decretals, and as being hyper-papal in tone, whence it has been conjectured to have been the first draft of the more extensive forgery of Isidore Mercator, and probably also from his pen. In France a great body of canon law, framed independently of Rome, was compiled from the enactments of a long series of national synods, and helped to build up those Gallican liberties which were steadily maintained against attempted papal encroachments. Spain, too, though more readily admitting papal intervention, had its peculiar local code. In England, partly from national character, and partly by reason of its remoteness from Italy, the growth of a national code of canon law was rapid and luxuriant. Most of the enactments of which it consists were framed in provincial synods under various archbishops of Canterbury; but a certain proportion is formed of Legatine Constitutions, enacted in synods held under the papal legates, Otho and Othobon, sent to England by popes Gregory IX. and Clement IV. in the reign of King Henry III., and between the years 1220 and 1268. At the era of the Reformation, the statute for the submission of the clergy and restraint of appeals (25 Henry VIII. chap. 19) enacted that a commission of thirty-two persons, half clergy and half members of the two houses of parliament, should review and report on the existing canons; such as the commission approved were to be revalidated by the king's assent under the great seal, and such as they disallowed to be abolished. In the meantime, all such existing canons as were not contrariant to the laws of the realm, nor hurtful to the king's prerogative, should still be used and executed. But this commission never met nor acted, and attempts to bring it into operation fell through under both Edward VI. and Elizabeth, and have not since been renewed. The legal result is that the statute of Henry VIII. remains the ruling one upon the subject, and thus that all the ancient canon law of England, which does not conflict with former or later canons or civil statutes, is still binding in ecclesiastical law. For post-Reformation canons, see CANONS OF THE CHURCH OF ENGLAND.

The bibliography of the canon law is very extensive, and only a few of the most essential works can be given here: Beveridge, *Synodikon, sive Pandectæ Canonum* (2 vols. folio, Oxford, 1672-82), and *Collatio Synodici* (2 vols. folio, Oxford, 1677); Justellus, *Bibliotheca Juris Canonici Veteris* (2 vols. folio, Paris, 1661); Fleury, *Institution au Droit Ecclésiastique* (2 vols. 12mo, Paris, 1771); Maastricht, *Historia Juris Ecclesiastici* (8vo, Halle, 1719); *Corpus Juris Canonici*, edd., Friedberg et Richter (2 vols. 4to, Leip. 1879); *Codex Juris Canonici* (præf. Card. Gasparri, 1917); Phillips and Vering, *Das Kirchenrecht* (8 vols. 1845-89); Hinschius, *Das Kirchenrecht der Katholiken und Protestanten in Deutschland* (1869 et seq.); Lyndwood, *Provinciale sive Constitutiones Angliæ* (folio, 1679); Ayliffe, *Parergon Juris Canonici Anglicani* (1726); Johnson, *Laws and Canons of the Church of England* (1851); Gibson, *Codex Juris Ecclesiastici Anglicani* (1761); on the sources and history, Tardif (Paris, 1887) and Schulte (Stuttgart, 1875-83); F. W. Maitland, *Roman Canon Law in the Church of England* (1898); Ogle, *Canon Law in Medieval England* (1912).

Canons, BOOK OF, in Scottish ecclesiastical history, a code of canons or rules for the Church of Scotland, prepared by the Scottish bishops, in obedience to the command of Charles I., revised by Laud, confirmed by letters-patent under the great seal, 23d May 1635, and published at Aberdeen in

1636. It tended much to increase the dissatisfaction prevalent throughout Scotland, which soon broke out so violently. It not only required the most strict adherence to the Liturgy, then not yet published, but enjoined many things concerning ceremonies in worship beyond what Laud had been able to introduce in the Church of England; it also took away the powers of church-courts unless ratified by the bishops, and decreed the penalty of excommunication against all who should deny the government of the church by bishops to be scriptural, whilst its very first canon decreed that penalty against all who should deny the king's supremacy in ecclesiastical affairs.

Canons of the Church of England, called Constitutions and Canons Ecclesiastical, agreed upon, with the king's license, in the synod held at London in 1603-4. They were drawn up by the Convocation of Canterbury, and accepted by that of York, in order to give effect to the decisions of the Conference held at Hampton Court; and are, for the most part, a digest of old injunctions and canons, with some new ones added. They are 141 in number. They are the basis of the ecclesiastical law, so far as the clergy are concerned, but they are not binding upon the laity, except in so far as they are declaratory of that part of the ancient canon law which had received parliamentary sanction. There had been previous bodies of canons drawn up in 1571, 1576, 1585, and 1597, but those of 1576 had not been sanctioned by the sovereign, and the remainder had been sanctioned for her lifetime only, and so lapsed at her death, not having been published in accordance with the Act 25 Henry VIII. chap. 19. Much of the code of 1603 has become obsolete, either by disuse or as the result of incompatible legislation by the civil power, and notably by the transfer of matrimonial and testamentary causes to the jurisdiction of secular courts. In 1640 the Convocation, which was then assembled with the parliament, prolonged its session beyond it under a fresh writ from the crown, and passed a body of canons of a very aggressive character; amongst other things, enjoining that on some Sunday in every quarter, every officiating minister should insist on the divine right of kings and their prerogatives, and enforce conformity to the rites of the Church of England. In these canons it was directed that the communion-table should be railed in, and be placed as in cathedrals, which is now done in all churches; and another canon obliged the clergy to swear conformity to the Church of England in a form known as the 'Et Cætera Oath,' which raised an uproar throughout the country. These canons were abrogated by an act passed in the 13th year of Charles II. An account of these canons and those now in force may be found at length in Hook's *Church Dictionary*.—Every clergyman, when instituted to a benefice or licensed to a cure, promises *Canonical Obedience* to the bishop—i.e. the obedience due according to the canons of the church.

Canopus, or CANOBUS, a city of ancient Egypt, from which the Canopic mouth of the Nile derived its name, was situated on the sea-coast, 15 miles E. of Alexandria. Here the boundary line between Asia and Africa was drawn by the ancient geographers. Canopus had a famous temple of Serapis, considerable commerce, and an evil reputation for the luxury of its citizens. Its ruins are visible near Aboukir. Canopic Vases, named from the city, were vases used by the Egyptian priests to contain the viscera of embalmed bodies. Canopus is also the name of a star of the first magnitude in the southern constellation Argo.

Canopy (Lat. *conopeum*; Gr. *kônōpeion*, from *kônōps*, 'gnat' or 'mosquito') was originally a

mosquito-curtain. Herodotus (ii. 95), Horace (Epod. ix. 9), and others of the ancient writers mention gnat-curtains (conoepa). Subsequently the same term came to be used for the projecting covering and hangings of a bed, without reference to their original use, and latterly for any projecting covering of a similar form, to whatever use it might be adapted, or of whatever materials it might be formed. Canopy is thus used to signify the covering which is borne over the heads of kings and other persons of distinction, and still more frequently over the Holy Sacrament and the image of Christ in processions in Roman Catholic countries. See BALDACHIN.

In Gothic architecture, canopy is the term applied to the stone coverings usually projected over statues,



Canopy — Archbishop Peckham's Monument, Canterbury Cathedral.

both on the exterior and in the interior of buildings, to protect them from the rain and dust. They were introduced as early as the 12th century, and were then designed so as to resemble a small gabled roof or the top of a building furnished with gablets and turrets. As the style advanced, the design of the canopies was carried out in harmony with the other features of the various periods, becoming in the Decorated period more like a pinnacle in shape and ornament, while in the Flamboyant and Perpendicular the canopies partook of the florid and fantastic character of those styles.

The term canopy is also applied to the gable-shaped and crocketed mouldings frequently placed over doors, windows, niches, &c.; also to ornamental stone coverings placed over tombs, of which fine examples may be seen in Westminster Abbey. The wooden coverings erected over the prebendaries' stalls in cathedrals, which are of infinite variety of design, are also called canopies, as well as the lofty ornamental tops which are often introduced over bishops' thrones, pulpits, and altars.

Canosa, a town of Southern Italy, in the province of Bari, 13 miles SW. of Barletta. It is situated on the declivity of a steep hill, whose summit is crowned by a ruined castle. It has a cathedral (1101–1825), with the tomb of Bohemond I.; but it is chiefly remarkable as occupying the site of ancient *Canusium*, one of the chief cities of Apulia. Sepulchres have been found here containing painted vases and funereal furniture of the most magnificent description, painted busts, marble statues, &c.; and countless antiquities have been transferred hence to the museum at Naples. There are also ruins of an amphitheatre, gateway, aqueduct, &c. Canosa suffered by earthquake in 1851. Pop. 25,000. See CANNÆ.

Canossa, a ruined castle of Northern Italy, 12 miles SW. of Reggio. In its courtyard the emperor Henry IV. (q.v.) stood shivering, bareheaded and barefooted, for three whole days (25–28th January 1077) before Pope Gregory VII., who was staying here with the Countess Matilda of Tuscany,

admitted him to his presence, and removed the ban of excommunication.

Canova, ANTONIO, the founder of a new school of Italian sculpture, was born November 1, 1757, at Possagno, a village in the Venetian territory. Having displayed in boyhood great talent in modelling, the artist gained the patronage of Giovanni Falieri, a Venetian senator, by whom he was sent to work under a sculptor at Bassano. His first imaginative performance, 'Eurydice,' half the size of life, was executed in his seventeenth year. After this he went to Venice, where his study of art properly began. In 1779 Falieri sent him to Rome, with an introduction to Cav. Zuliano, the Venetian ambassador, and one of the most illustrious patrons of art at this time in Italy. In Rome the first result of his studies appeared in the statue of 'Apollo,' which must be regarded as his earliest effort in ideal sculpture; but a far greater progress toward the pure style of the antique was evident in his next work, 'Theseus with the Minotaur,' executed in 1782. Nevertheless, Canova did not rigorously adhere to the severe simplicity of the antique, but endeavoured to infuse into his works a peculiar grace and loveliness of his own, such as characterised his group of 'Cupid and Psyche,' which was produced soon after he had completed, in 1787, the monument of Pope Clement XIV. This is apparent even in the colossal monument of Clement XIII. (erected in St Peter's, 1792); though this work, on the whole, is a magnificent effort of genius, simple in style, and with nothing overwrought in the figures. The most important of his monuments is the tomb of the Archduchess Christina of Austria, in the church of the Augustines in Vienna. Among his other works may be noticed a 'Winged Cupid,' 'Venus and Adonis,' a 'Psyche holding a Butterfly,' 'Penitent Magdalen,' in life-size; 'Hercules hurling Lichas from the Rock,' a colossal work, but not free from affectation; 'Creugas and Damoxenos' (two pugilists); 'Palamedes'; and 'Perseus with the head of the Medusa,' a work which, more than all previous efforts, served to raise his fame. In 1802 Canova was appointed by Pope Pius VII. chief curator of all Roman works of art in the Papal States; but in the same year he was called away to Paris, to prepare the model of a colossal statue of Bonaparte.

After the fall of the French empire, Canova in 1815 was employed by the Roman government as ambassador to recover the works of art which had been taken to Paris, and paid a visit to England. On his return to Rome, he was created Marquis of Ischia, with a pension of 3000 scudi. This money he expended in the support of art and artists in Rome. Canova died in Venice, 13th October 1822. The essential characteristic of all his works is sentiment—often verging, however, on sentimentalism, and this also, like his delicacy in details, was accordant with the taste prevalent in his time, and was the chief cause of his popularity, as of his errors. Judged by the sterner principles of antique sculpture, the works of Canova are artificial and deficient in force and realistic character.

During his leisure Canova amused himself with painting, in which he followed the colouring of the Venetian masters. In his private life he was a very amiable and benevolent man. Biographies of Canova have been written by Missirini (4 vols. Prato, 1824), Cicognara (Venice, 1823), Rosini (Pisa, 1825), and D'Este (Flor. 1864). A series of outline engravings, by Henry Moses, from his works, was published in London in 1824, with translations of the descriptions of the Countess Albrizzi and of the memoir by Count Cicognara.

Canrobert, FRANÇOIS CERTAIN, Marshal of France, born at St Ceré in Lot, 27th June 1809,

studied in the military academy of St Cyr, and in 1828 entered the army. He had seen close upon twenty years' brilliant service in Algeria, and had actively supported the future emperor at the *coup d'état* of 1851, when in January 1853 he received the rank of a general of division. As such he commanded the first division of the French army under Marshal St Arnaud, sent to the Crimea in 1854; and at the battle of the Alma was wounded in the breast and hand by the splinter of a shell. On St Arnaud's death nine days later, Canrobert assumed the chief command of the French army. According to Kinglake, he deliberately retarded the progress of operations, let slip many opportunities, and hampered the English—his object therein being to forward Napoleon's plan of himself coming out to head a final and victorious campaign. In the war in Italy against the Austrians (1859) Canrobert had the command of the third division of the French army, and at the battles of Magenta and Solferino his *corps d'armée* was engaged. In the Franco-German war of 1870 he was shut up in Metz with Bazaine, and became a prisoner in Germany. In 1876 he became a member of the senate, and he died 28th January 1895. See *Lives* by Martin (1895) and Germain Bapst (4 vols. 1893-1909).

Canso, CAPE, the eastern extremity of Nova Scotia, at the entrance of Chedabucto Bay. Canso Strait, a passage 17 miles in length and $2\frac{1}{2}$ in average breadth, separates Nova Scotia from the island of Cape Breton.

Cant, ANDREW, a Scottish Covenanter, born about 1590, became minister of Pitsligo in 1633, of Newbattle in 1638, and of Aberdeen in 1640. In July 1638 he had been one of the commissioners sent to that city to compel the inhabitants to subscribe the National Covenant; and in November of the same year he was a member of the memorable General Assembly, held at Glasgow, which abolished Episcopacy in Scotland. Withal, he was a zealous royalist. He was with the Scots army when it obtained possession of Newcastle, August 30, 1640; and in 1641, on the second visit of Charles I. to Scotland, Cant preached before his majesty at Edinburgh. In 1660, in consequence of a complaint presented to the magistrates of Aberdeen, charging him with having published Rutherford's *Lex Rex*, and with fulminating anathemas and imprecations against many of his congregation, Cant relinquished his charge and left the town. He died 30th April 1663, leaving a son, Andrew, who was principal of Edinburgh University from 1675 to 1685.

Cantabile, in Music, is a term placed over sections of easy and flowing melody, in contradistinction to brilliant passages or rapid executive runs, as well in instrumental as vocal music. In the cantabile style the finest effects can be produced by the singer in swelling, sustained sound, the portamento, &c. Cantabile is also called *cantilena*.

Can'tabrigi, a rude race of mountaineers in the north of ancient Spain, who inhabited the region south of the Bay of Biscay, named from them the *Oceanus Cantabricus*. The question of their affinities forms part of one of the most difficult problems in the whole range of ethnology. W. von Humboldt identified them as a remnant of the ancient Iberian population of Western Europe, and found their descendants in the modern Basques of the Pyrenees. The bravery of the Cantabrians was evinced in the Cantabrian war with the Romans, begun under Augustus in 25 B.C., and concluded by Agrippa six years later. Their indomitable spirit is often alluded to by Horace and other poets. Tiberius afterwards stationed garrisons in the towns, but some of the people retreated into their fastnesses among the mountains, where they pre-

served their independence. Of their nine towns the chief was Julisbrica.

Cantacuze'nus, a Greek princely family. (1) JOHANNES CANTACUZENUS was a noted soldier and statesman of the Byzantine empire in the reigns of Andronicus II. and III., the latter of whom in 1341 left him guardian and prime minister of his son, Johannes V., then nine years old. Cantacuzenus, however, proclaimed himself the child's colleague, 26th October 1341, and after a five years' civil war secured his recognition, as well as the marriage of one daughter to the young emperor, and of another to the Sultan Orchan, whose help had been necessary to him. A second war, during which the Turks occupied Gallipoli, caused his retirement in 1355 to a monastery, where he died in 1383. He wrote a history of his time, and a defence of Christianity.—(2) MATTHIAS, his son, was also made a colleague in the empire in 1353, and on his father's abdication began a war which ended, two years later, in his own deposition. He too died in 1383.—(3) His brother, MANUEL (died 1380) was governor of Peloponnesus from 1348, and was recognised as despot of Misithra by Johannes V.; he did much to encourage the immigration of the Albanians into the depopulated Morea.—The family was notable among the Fanariots (q.v.), and in later years a Russian branch supplied several brave and successful leaders to the cause of Greek independence.

Cantal, a department in the interior of Southern France, formed out of the south portion of the old province of Auvergne. With an area of 2229 sq. m., it had a population in 1890 of 239,601, in 1921 of only 199,402. See AUVERGNE.

Cantarini, SIMONE, also known as IL PESARESE, an Italian painter, born at Pesaro in 1612, studied under Guido Reni at Bologna, where he afterwards painted a large number of pictures, all much in the style, but without the grace and delicacy, of his master's works. His thirty-seven etchings more closely resemble those of Guido. Throughout his life Cantarini's intolerable arrogance made him numerous enemies; and after a quarrel with his chief patron, the Duke of Mantua, he died at Verona in 1648, not free from a suspicion of having poisoned himself.

Cantata, in Music, was originally the name applied to a sort of musical narrative by one person, accompanied by a single instrument. Subsequently an air was introduced, repeated at intervals during the recitative. Many works now forgotten were written in this form by Carissimi and other composers of the 17th and 18th centuries. It is represented in modern music by the concert-aria (see ARIA). The name is now applied to choral works, either sacred, and similar to, but shorter than the oratorio; or secular, either lyric or dramatic, but not intended for the stage.

Canteen is a refreshment-house in a barrack for the use of the soldiers. In the British army bread and meat are supplied to the soldier direct by the commissariat, but he has to buy beer and groceries for himself; and the canteen is a shop where he can do so at practically cost price, with a certainty that they will be good, without going beyond the precincts of the barrack. The men living in each room are formed into a mess, which opens an account with the canteen for the supply of dinner beer, tea, coffee, potatoes, and other similar necessities. The mess accounts are kept by the non-commissioned officer in charge of the room, made up weekly, and inspected by an officer. A certain fixed sum is charged to each man's account to defray the mess expenses, and the canteen bill is paid monthly. A mess is not allowed to get into debt to any extent. If one

week's account shows a deficit, the men have to go without something the next week in order to clear it off. They can also buy anything they like from the canteen on their own account, paying for it in cash. Formerly the canteens were under civilian tenants, at rents varying from £4 to £1344 per annum, realising collectively about £70,000 annually. Gross intoxication having resulted from the sale of spirits at the canteens, the War Office prohibited such sale in 1847, lowering the rents by £20,000 to meet the reduced profits. As it was to the tenant's interest to encourage the soldier to drink, as well as to adulterate the articles sold, and to charge high prices, the canteen has since 1857 been made a regimental establishment, controlled by a committee of officers, with a canteen-sergeant, on a fixed salary, as salesman. Tobacco and the smallwares required by the troops are also sold at canteens. The profits are utilised for the benefit of the men and the families of those who are married. Canteen procedure is, since the Great War, unified under the control of the Navy and Army Canteen Board, which depends on the Quartermaster-general's department of the War Office.

In French barracks the canteen is a sort of club-room for the whole regiment. The *continier* is a non-commissioned officer, who acts merely as an agent for all, selling commodities at prime cost.

Canterbury, a county borough, cathedral city, and the seat of the metropolitan see of all England, in east Kent, 56 miles ESE. of London. Standing in a plain on the banks of the Stour, amid gently swelling hills, it occupies the site of the Roman *Durovernum* and Jutish *Cantwaraburh* ('borough of the men of Kent'), and from its position on the great London high-road must always have been a place of importance. There are some remains of the ancient walls (1½ mile in circuit and 20 feet high), and the West Gate (*circa* 1380) is the survivor of six. Near the city wall is a large artificial mound, known as the Dane John (probably *Donjon*), and connected with this mound is a public garden, laid out in 1790, from the top of which is a fine view of the country around. The much mutilated castle, whose Norman keep resembled Rochester's, has been degraded to a gaswork; the guildhall (1439; rebuilt 1697) has been refaced with modern brick; and the Chequers' Inn, where Chaucer's pilgrims lodged, lost its 'dormitory of the hundred beds' by fire in 1865.

But the great glory of Canterbury is its magnificent cathedral, whose precincts are entered through a splendid Perpendicular gateway (1517). When in 597 St Augustine became Archbishop of Canterbury, he consecrated, under the name of Christ's Church, a church said to have been formerly used by Roman Christians. Enlarged by Archbishop Odo (942-959), this church was totally destroyed by fire in 1067. Archbishop Lanfranc and Priors Ernulf and Conrad rebuilt it (1070-1130), and it was this cathedral that witnessed the murder of Becket, 29th December 1170. The choir was wholly burned down in 1174, and to rebuild it a number of French and English artificers were summoned. Among the former was one William of Sens, and to him, a man of real genius, the work was entrusted. The

church was rich in relics: Plegmund in 890 had brought hither the body of the martyr Blasius from Rome; here too were the bodies of SS. Wilfrid, Dunstan, and Alfege, and now of the great martyr, St Thomas of Canterbury. The offerings at these shrines, especially the last, contributed greatly to defray the expenses of the sumptuous work. William of Sens did not, however, see its completion. He was succeeded in 1178 by another William, an Englishman, and to him we owe the completion of the existing unique and beautiful choir, with the choir transept, the retro-choir or Trinity Chapel, and the corona or circular apse called Becket's Crown. Gervasius, a monk, who witnessed the fire of 1174, and has left an account of it, tells us that the parts of Lanfranc's church which remained in his time were the nave, the central and western towers, the western transepts, and their eastern chapels. In 1378-1411 the nave and nave-transepts were transformed by Prior Chillenden into the Perpendicular style of that period. The central or 'Bell Harry' tower, successor to the Angel steeple, was carried up (1495) to about double its original height; also in the Perpendicular style, it is 235 feet high, and 35 feet in diameter. The north-west or Arundel steeple was taken down and rebuilt in 1834-40; like the south-west or Dunstan steeple (1413-44), it is 130 feet high. The Norman plinth still remains on each side of the nave in the side aisles, and portions of Norman ashlar-work may still be seen about the transepts outside the west wall, and on the east piers of the great tower. The indiscriminate use of the Round or Norman and the Pointed or Early English arch is also a very striking feature in the eastern part of the building. The Lady Chapel,



Canterbury Cathedral.

now called the Dean's Chapel, stands on the north side of the church, and was built between 1449 and 1468; the roof is a rich fan-vault. The adjoining north transept is called the Martyrdom transept, for here took place the murder of Becket. In 1220, fifty years later, his remains were translated from the crypt to a shrine in the newly erected Trinity Chapel, eastward of the choir. About the year 1500 the yearly offerings at this shrine amounted to £4000 of our present money, though then they had declined much in value. A curious mosaic pavement still remains in front of the place where the

shrine stood, and the stone steps which lead up to it are worn by the knees of countless pilgrims; but the shrine itself was demolished in 1538, when its treasures filled twenty-six carts. (In 1888 a stone coffin, with remains of a skeleton, supposed to be Becket's, was discovered in the crypt, and reinterred there after careful examination.) In 1643 the building was further 'purified,' as it was called, by order of parliament. Still very many most interesting monuments remain—such as the tomb of Stephen Langton; that which is commonly, but wrongly, supposed to be the tomb of Archbishop Theobald; with those of the Black Prince, of Henry IV., of Archbishops Peckham, Meopham, Stratford, Sudbury, Courtenay, Chicheley, Stafford, Kemp, Bouchier, Morton, Warham, and Cardinal Pole. The fifty-one statues that since 1863 have adorned the south porch and the western entrance include 19 of Canterbury's archbishops, 21 English sovereigns, 3 deans, Erasmus, &c. Of stained glass there are some fine old specimens; some modern ones of very varied merit, two of these being very fine. The total length of the cathedral is 522 feet, by 154 in breadth at the eastern transept. Its predominant styles are Transition-Norman and Perpendicular. The crypt is of greater extent and loftier—owing to the choir being raised by numerous steps—than any other in England. In 1561 it was given up by Elizabeth to a congregation of French and Flemish Protestant refugees, whose successors now meet in the Black Prince's chantry. In 1872 the church narrowly escaped destruction for the fourth time by fire, the outer roof being burned, over all the east portion of the choir.

To the north of the cathedral are the eight-bayed Cloisters, 144 feet square; the Chapter-house (1411), 90 by 35 feet; the New Library; the Howley Library, containing the books of Archbishop Howley and Archdeacon Harrison; the beautiful Green Court; the Deanery (1517); and the King's School, founded or refounded (1541) by Henry VIII., and attended by Marlowe, Lord Tenterden (natives), Dr Harvey, and 'David Copperfield.' These occupy the site, and in part the buildings, of the Benedictine Priory of Christ's Church. The remains of the Abbey of St Augustine, to the east, were in 1844-48 transformed by Mr Beresford Hope into an Anglican missionary college. In the Abbey field 20th-century excavations have laid bare the foundations of Ethelbert's church (with the empty tombs of some of the first archbishops), of Wilfrid's round church and other early remains. There are fourteen old churches in Canterbury, mostly of rough flint, and containing fragments of still older structures. St Martin's Church stands on the site of one of the 6th century, and is partly built of ancient Roman brick and tile; its font is said to be the very one in which Ethelbert was baptised by St Augustine. St Dunstan's contains the monuments of the Ropers, and, in a vault, the head of Sir Thomas More. The archbishop's palace, scene of the death of the Black Prince, was built by Lanfranc, superseded for centuries by Lambeth and Addington Park, but rebuilt by Archbishop Temple shortly before his death in 1902. The Clergy Orphan School is built on St Thomas's Hill, about a mile out of the city; the Simon Langton Schools were opened in 1882. There are, besides, several hospitals, barracks, a corn exchange, an art gallery (now a school of arts and crafts), presented by Sidney Cooper (a native), a free library and museum. Canterbury has a large trade in grain and hops, and a great 'cricket week.' In 1885-1918 the city returned only one member; it was then merged in the county (Canterbury division). Pop. 24,000.

See the articles ARCHBISHOP, ENGLAND (CHURCH OF), and those on the various archbishops and others mentioned

above; Boggis, *St Augustine's Monastery of Canterbury* (1901); Gleeson White, *The Cathedral Church of Canterbury* (1897); also Professor Willis's *Architectural History of Canterbury Cathedral* (1845-69), Dean Stanley's *Historical Memorials* (1854; new ed. 1904), the *Memorials* by Woodruff and Danks (1913), Dean Hook's *Lives of the Archbishops of Canterbury* (1860-76), Jenkins's *Diocesan History* (1880), and books on the city by Teignmouth Shore (1907) and G. R. S. Taylor (1912).

Canterbury, a 'provincial district' of New Zealand (q.v.), in the centre of the South Island; till the abolition of the system of provinces (see NEW ZEALAND) in 1876, it was a province, with Christchurch as its capital, and Lyttelton as its port. Its area is about 14,000 sq. m., and it is divided into two portions by the river Rangitara. The district was settled in 1850 by the Canterbury Association, a society of peers, bishops, and commoners interested in the colonisation of New Zealand. It has a coast-line of about 200 miles, a breadth of about 150, and is well watered by numerous rivers. Banks Peninsula, in its peaks, ridges, and basins, bears evidence of volcanic action. Coal in abundance, iron ore, fireclays, quartz, and gold exist, and several coal-mines are in operation. On the eastern side of the great range of hills are the far-famed Canterbury Plains, the great sheep district of the colony—'three millions of acres rolling back in gentle rise forty miles, to the foot of the central highlands, watered by twenty rivers, and spreading north and south farther than the eye can reach.' There is railway connection from Christchurch to Dunedin and the south and west coasts, with various branch lines. The staple trade is in wool and grain, with exports of frozen meat, New Zealand flax, skins, leather, and dairy-produce. The silk-worm has been introduced. Canterbury has an Anglican and a Roman Catholic bishop. The medicinal hot springs at Hanmar Plain in Amuri district have considerable celebrity. Mount Cook (12,349 feet) is the highest mountain in New Zealand. The population, 91,922 in 1878, had increased in 1881 to 111,049; in 1891 to 128,471; in 1901 to 143,041; in 1921 to 199,038.

Canterbury Bells. See CAMPANULA.

Cantharis, a genus of vesicant Coleoptera or Blister-beetles, familiarly represented by the Spanish Fly of southern Europe (*Cantharis* or *Lytta vesicatoria*). Some of the characters are noted under BLISTER-BEETLE. The insects are shaken with gloved hands from the branches of trees (ash, privet, lilac, elder, &c.), the gathering in the south of France taking place in May; they are usually killed in hot vinegar solution and carefully dried. To retain their medicinal vesicant properties they must be kept in stoppered bottles. The blistering principle, or cantharidin, is so powerful that those who gather the insects are apt to suffer, and 1/100th of a grain placed on the lip will raise blisters. Incautious internal application may cause fatal inflammation. Cantharidin took the place of cantharides in the British Pharmacopoeia of 1914. A distilled alcoholic solution of cantharidin is sometimes called Aqua Tofana (q.v.). The insects are usually imported to Britain from southern Europe or Russia. They rarely occur in England.

Canticles (literally 'unmetrical hymns or songs') is the name given to a book in the Old Testament, more generally known by its Hebrew title 'Song of Songs'—i.e. the most beautiful song in the world. The 'Song of Songs' was one of the last books to be added to the Old Testament, and full recognition was not granted to it as a canonical book of Scripture till the Synod of Jamnia in 90 A.D. (see BIBLE, *Formation of the Old Testament Canon*). There has been considerable discussion

as to the character, value, and interpretation of the book. Three different attitudes have been adopted towards it at different times. (1) After its admission into the canon, Jewish and Christian writers alike interpreted its statements allegorically. On the face of it, the book seems to consist of a collection of love-songs; but it was argued that the surface meaning of the Canticles could not represent its real teaching, since, if that were so, it would not be worthy of a place in the Bible. The songs must therefore have a symbolical reference. The love which is so vividly described could not be ordinary human affection, but must have a spiritual significance. Jewish writers made it symbolise the relation between God and Israel, and Christians, following the precedent set by Jewish rabbis, found in the Beloved Bridegroom a reference to Christ, and in the Bride a reference to the Church. In the middle ages the famous Bernard of Clairvaux preached a series of eighty-six discourses on the first two chapters of the book, adopting this 'mystical' or 'allegorical' method of interpretation. In these discourses the 'Bride' represents Christ, and the 'Bridegroom' the soul of the individual Christian. In devotional literature, even up to the present day, phrases from the book, such as, 'The chief among ten thousand,' 'the rose of Sharon and the lily of the valley,' 'My beloved is mine, and I am his,' are constantly applied to Christ. It was the use of this method of interpretation which led Rabbi Akiba to describe the book as a 'Holy of Holies,' and to say that 'no day in the history of the world is worth the day when the Song of Solomon was given to Israel.' Some protests were made at different times against this allegorising method, but they were never successful, and often met with reprobation. The attempt of Theodore of Mopsuestia to lead men back to a literal interpretation of the book resulted in the condemnation of his writings by the Synod of Constantinople in 551, long after his death, and Castellio was banished from Geneva in 1544 because he denied the spiritual meaning of the book, and argued that it was an amatory poem. It is only in recent days that the allegorical interpretation has been finally abandoned, and the Church has recognised that the plain meaning of the book is the true one. But having reached this decision, scholars are still divided as to the character of Canticles. (2) The most popular modern interpretation regards the book as a drama, the *motif* of which is the praise of constancy in love. The plot, however, is so slight and indistinct that no general agreement has been reached as to the number of the *dramatis personæ* or the division of the scenes. The best suggestion as to the plot is as follows: 'A Shulammite girl of great beauty is captured by some of Solomon's servants and brought to the palace. The king, attracted by her charm, makes ardent love to her, and wishes to add her to his harem. The girl in the poems seems to be responding to the king's overtures, but all the while she is thinking of her shepherd lover in the north, from whom not even the glamour of a royal alliance can divert her affection. At length the king, out of admiration for her constancy, returns her to her lover, and the melodrama ends with a wedding scene.' It must be admitted, however, that the plot is not apparent to the ordinary reader, and it is only by reading much into the songs that it can be obtained. The best exposition of this and other similar interpretations is to be obtained from Rothstein's article on the 'Song of Songs' in *Hastings's Bible Dictionary*. (3) The difficulty of finding any real plot in Canticles has led other scholars to suppose that the book is an anthology of Hebrew love-poems or wedding-songs, which are only connected together in the loosest possible way. Some

have discovered as many as thirteen different poems, but there is no general agreement as to the actual number. This theory is fully developed by Cheyne in the *Encyclopædia Biblica*. It used to be maintained that the book dated from pre-exilic times, and was a protest against the laxer morals introduced into the court by Solomon and his successors; but the Hebrew style, which belongs to a much later age, seems to make that view impossible, and it is now generally recognised that Canticles is certainly post-exilic, and may even be as late as the Greek period.

The best commentaries on Canticles are by Delitzsch-Hitzig, Ewald, Renan, Stickel, and Siegfried.

Cantilever, a large bracket for supporting cornices, balconies, and stairs. Cantilevers are often highly ornamented. The accompanying example supports a wide outside stone stair at the corner of Randolph Crescent, Edinburgh.



Cantilever.

For cantilever in bridge-building, see BRIDGE.

Cantire. See KINTYRE.

Canto Fermo. See PLAIN-SONG, CHANT, GREGORIAN TONES.

Canton, called also Yang-Ching (i.e. 'city of rams'), a large commercial city and port in the south of China, and capital of the province of Kwang-tung (of which the name Canton is merely a corruption), is situated in 23° 11' N. lat., and 113° 14' E. long., on the north or left side of the Shu-kiang, or Pearl River, in a rich alluvial plain, 70 miles N. of Macao and 90 NW. of Hong-kong. The Pearl River is the estuary of the same stream that higher up is called Boca Tigre (q.v.), or Bocca Tigris. Farther up still, the stream is known as the Canton River; and this is but the chief channel by which the united waters of the Si-kiang and the Pe-kiang rivers reach the sea through the delta. The city was till 1919 surrounded by walls of brick and sandstone, 25 to 40 feet high, 20 feet thick, with an esplanade inside, 6 miles in circumference; and divided by a partition wall running east and west into two unequal parts, the north or old city, much the larger, and the south or new city. There were twelve outer gates, four gates in the partition wall, and two water gates, shut and guarded by night. The entire circuit, including suburbs, is nearly 10 miles. At the south-west corner of the suburbs, south of the river, are the Hong or European quarter, divided from the river by a quay, 100 yards wide, called Respondentia Walk. The streets, more than 600, are in general less than 8 feet wide, and very crooked, but some motor-roads have been made since 1919, including one which encircles the city on the site of the wall. The houses along the water-side are built on piles, and subject to inundations. Ancient barricades enclose each street, and in the principal streets night-watchmen in watch-towers proclaim the hours and sound fire alarms. There are two pagodas, the 'Plain Pagoda,' erected ten centuries ago, 160 feet high, and an octagonal nine-storied pagoda, 175 feet high, erected more than 1300 years ago; and 124 temples or Joss-houses. The Honam temple, one of the largest in Canton, covers, with its grounds, 7 acres. Hundreds of priests are attached to it and to the 'Temple of Filial Duty.' The 'Temple of Five Hundred Genii' has 500 statues of various sizes in honour of Buddha and his disciples. The Examination Hall in the old city is 1330 feet by 583 feet, covers 16 acres, and has 8653 cells. There are also in Canton several

prisons, an arsenal, a mint, a handsome English church, many public schools and colleges, a founding hospital, an English and an American missionary hospital. Nearly half the craft on the river are fixed residences, and the population on water forms a very large proportion of the whole. The climate of Canton may be pronounced healthy. The average temperature ranges from 42° to 96° F.; though falls of snow have occurred. There are fogs in February and March. From October to January the temperature is agreeable, the sky clear, the air invigorating. The average rainfall is 70 inches annually.

The admirable situation of Canton, connected by three rivers with the whole province east, north, and west, and to the west with the distant interior of China, and commanding a safe and commodious anchorage for the largest vessels, explains how, from an early period, it was a favourite port with foreign merchants. The earliest notices date back to two centuries B.C. In 700 A.D. a regular market was opened and a collector of customs appointed. The Arabs made regular voyages hither as early as the 9th century. The Portuguese found their way to it in 1517, and were followed by the Dutch a hundred years later. These in turn were overtaken and supplanted by the English before the close of the 17th century, and an immense trade was carried on by the agents of the East India Company. Their monopoly ceased on the 22d April 1834. Since that date the proceedings of the Canton government officers have originated two wars with the British. The city was captured by the allied French and English forces, December 1857, and continued to be garrisoned by them till October 1861 (see CHINA). After the treaty of Nankin (signed 29th August 1842), Canton was known as one of the five treaty ports, with Amoy, Fuchow, Ningpo, and Shanghai. Foreign commerce, however, is still hampered in many ways in Canton. The general insecurity of property renders it necessary that every shop which contains anything of value should be barricaded at dusk, so that it could stand a siege: at sunset business must stop.

The chief exports are silk, tea, porcelain, matting, sugar, and cassia; the chief imports, cotton, woollen, and metal goods, food-stuffs, kerosene, &c. The city is one of the chief silk manufacturing centres in China; it has also wool and cotton mills. Canton played a leading part in the republican movement, and as champion of parliamentary government and socialism headed the south against Peking and the north. The population of the city, variously estimated between 500,000 and 2,500,000, is probably under a million.

Canton, capital of Stark county, Ohio, on the Nimishillen Creek, 56 miles SSE. of Cleveland by rail, with foundries, extensive iron and steel manufactories, paper and woollen mills, &c.; pop. (1860) 4041; (1880) 12,258; (1920) 87,091.—(2) A town of Fulton county, Illinois, 25 miles WSW. of Peoria, with coal-mining and some factories; pop. 11,000.—(3) A town of Norfolk county, Massachusetts, 14 miles S. of Boston, with cloth and metal manufactures; pop. 6000.

Canton (Fr.), a division of territory, constituting a separate government or state, as in Switzerland; or, as in France, a collection of communes, forming a subdivision of an arrondissement. In France the canton sends one member to the council of the arrondissement, but is in no other sense an administrative division.

Canton. See HERALDRY.

Canton, JOHN, electrician, born at Stroud, 31st July 1718, was apprenticed to a cloth-weaver, but early showed a bent towards scientific studies. In 1737 he settled as a schoolmaster in London, and,

becoming famous for his experiments in electricity, was elected a Fellow of the Royal Society in 1749. He repeated and verified Franklin's experiments and hypotheses; he invented an electroscope and an electrometer; he originated experiments in induction; he was the first to make powerful artificial magnets; and in 1762 he demonstrated the compressibility of water. His name is permanently associated with 'Canton's phosphorus,' discovered by him in 1768—an impure sulphide of calcium, prepared by heating calcined oyster-shells with sulphur in a closed crucible. After being exposed to light, it shines in the dark like luminous paint (see CALCIUM). Canton, who was a friend of Priestley's, died 22d March 1772.

Canton, WILLIAM, born in 1845 in Chusan, and educated in France, was on the staff of the *Glasgow Herald* and the *Contemporary Review*, and managed a publishing house. He wrote *The Invisible Playmate*, *W. V. her Book*, *The Comrades*, and other books in prose and verse, including several on the Bible and the Bible Society.

Cantonments are the villages, farms, or other buildings in which troops are temporarily lodged while taking part in manœuvres or active operations. In the latter case a careful arrangement of guards and sentries is necessary to prevent the men being surprised before they can turn out of the houses; and places of assembly, called alarm posts, are selected at which they can collect.

In India, however, cantonments have become permanent military towns, distinct and at some little distance from the principal cities. A large cantonment contains barracks for European troops; bungalows or houses, in gardens, for the officers; huts for the native soldiery; magazines and parade-grounds; public offices and buildings of various kinds; and a bazaar for the accommodation of the Camp Followers (q.v.) and other natives. See BILLETING, BIVOUAC, and CAMP.

Cantor. The Latin genitive *Cantoris* is used to denote the north side of the choir in English cathedrals, as the precentor or cantor usually sat at that side. The south was the dean's side (*Decani*). See CHOIRS.

Cantù, CESARE, Italian author, was born 8th December 1807, at Brivio, in the Milanese territory, and was destined for the priesthood, but early adopted literature as a profession. Imprisoned in 1833 for expressing liberal tendencies in an historical work on Lombardy, he spent his leisure hours in describing the sorrows of a prisoner in an historical romance, *Margherita Pusterla* (1838), only less popular than Manzoni's *I Promessi Sposi*. His *magnum opus*, the *Storia Universale* (35 vols. 1836-42), was succeeded by a multitude of works on Italian history and literature, as well as works of a lighter character, and *Manzoni: Reminiscenze* (2 vols. 1883). He died at Milan, 11th March 1895.

Canute. See CNUIT.

Canvas, ARTISTS', the principal material upon which oil-paintings are made. Before it is put into the artist's hands it is usually *primed*, or grounded of a neutral gray, or other tint, as he may direct. Certain sizes of canvas, being in greater request than others, are kept ready mounted on wooden stretchers. The stretchers are provided with wedge-shaped keys at the corners, for tightening the canvas should it become slack. Those used for portraits are known by the names of kit-cat, which measures 28 or 29 inches by 36; three-quarters, 25 by 30 inches; half-length, 40 by 50; Bishop's half-length, 44 or 45 by 56; Bishop's whole length, 58 by 94.

Canvas-back Duck (*Fuligula vallisneria*), a common bird on the Atlantic coasts of the United

States, abundant for instance in Chesapeake Bay. It belongs to the general group of wild ducks, but ornithologists have differed somewhat as to its generic title. The names *Aythya*, *Nyroca*, *Aristonetta*, *Fulix*, and *Fuligula* seem all applied to it. It is a handsome bird, especially in the somewhat larger and more decorative male sex. The popular name refers to the ashy-white colour of the male's back, crossed by broken zigzag lines. *F. americana* or Red-head Duck is closely allied. Both, but especially the Canvas-back, are prized for the table.

Canzoné is the name of one of the most important forms of Italian lyric poetry. It seems to have grown out of the *canzo* of the troubadours, which was in their hands, however, exclusively reserved for themes of love. The Italian canzone consists of a series of stanzas, of various metrical arrangements, and restricted to no set themes. In the Petrarchian canzone the stanzas exactly correspond in the number and measure of the lines, as also in the sequence of the rhymes. It often concludes with a short stanza, known as the *envoi*. Petrarch is the great master of the canzone in the earlier, and Leopardi in the later, period of Italian literature. In music, *canzona* and *canzonetta* or *canzonet* are songs of similar character to the madrigal, or instrumental imitations thereof. *Canzonetta* has also been extended to vocal solos, especially of a light order. The French *chanson* is simply a song.

Caoutchouc. See INDIA-RUBBER.

Cap. See BONNET, PERCUSSION CAPS, and MAINTENANCE (CAP OF).

Capacity, LEGAL, means the power to alter one's rights or duties by the exercise of free will, or responsibility to punishment for one's acts. Civil capacity depends on Age (q.v.) and mental condition (see INSANITY). But civil incapacity is often imposed as a punishment on persons of full age and undoubted mental capacity. Convicts and persons attainted are placed under a general civil incapacity, and partial incapacities are also imposed as punishments—e.g. where a person is found guilty of bribery he becomes incapable of a certain public office. The English law of infancy, imposing a general disability to contract (except for necessities) on all men up to the age of 21, is not founded on physiological fact, and requires alteration. The disabilities attaching to married women have been largely removed by recent legislation in both England and Scotland. For supposed political reasons aliens were for a long time debarred from ordinary civil rights, and they are still properly excluded from political rights until they naturalise themselves and adopt the obligations of a subject. Different tests of capacity are applied to different transactions, as Contract (q.v.) and testament.

Cap-à-pie (Fr., 'head to foot'), in the military language of the middle ages, was applied to a knight or soldier armed at all points, or from head to foot, with armour for defence and weapons for attack.

Cape Breton, a rocky island of irregular form in British North America, at the eastern extremity of Nova Scotia, from which it is separated by the Gut of Canso, 1 mile broad. It has an extreme length of 100, a breadth of 85, miles; area, 4000 sq. m., with a population of 131,500. The coast is greatly indented with bays, and an inlet, the *Bras d'Or*, entering the island on the east, forms a lake (50 miles long, and 20 broad) which renders most of the interior accessible by water, and which, now continued by a ship-canal ($\frac{1}{2}$ mile) to St Peter's Bay, on the south coast, bisects the island. The climate is moist, but milder than that of the adjoining continent; the principal exports are timber, fish, iron ore, and coal. The island produces maize and

other grains, though not in sufficient quantities for home consumption. Originally a French possession, it was taken by the English in 1745; but being subsequently restored to France, it was again captured in 1758, and in 1819 became part of the province of Nova Scotia. The city of Sydney has 22,500 inhabitants, the town of Glace Bay 17,000; the once famous Louisburg, stripped of its fortifications, is now unimportant.

Cape Coast Castle, a settlement of Great Britain in the Gold Coast Colony, in Upper Guinea, 315 miles W. of Lagos. The place lies in a chasm, and, as its name implies, is defended by the great castle near the water's edge, and by three small forts on the hills behind, one of which serves as a lighthouse and signal-station. Ceded by the Dutch to the English in 1665, Cape Coast Castle, from 1672, was possessed by several British African companies till 1843, when it was taken over by government. In 1875 it was superseded by Accra as capital of the Gold Coast. The town has a trade in palm-oil. There is a telegraph line to Accra, and a fair road from Cape Coast to Prahue (75 miles). L. E. Landon died here in 1838. Pop. 11,000.

Cape Cod, properly a narrow peninsula of Massachusetts, in form somewhat like the letter L, which, with a length of 65 miles, forms the south-east boundary of the great bay of that state. The northern extremity, marked by a revolving light 183 feet high above the sea, is in 42° 3' 40" N. lat., and 70° 14' 48" W. long. A ship-canal across the neck of the peninsula, 25 feet deep, and 250 feet wide, was constructed in 1910-13.

Cape Colony. See CAPE OF GOOD HOPE.

Capefigue, BAPTISTE HONORÉ RAYMOND, French author, was born at Marseilles in 1802, and in 1821 came from Aix to Paris to complete his juridical course, but from 1830 devoted himself to literature. He died 23d December 1872. Historian, antiquary, and politician, Capefigue was first and foremost a romanticist. The best of his works, which fill nearly a hundred volumes, was almost the first—*Histoire de Philippe Auguste* (1829).

Cape Gooseberry, a somewhat unfortunate name for the GOOSEBERRY TOMATO (*Physalis peruviana*), a South American solanaceous plant of the same genus as the Winter-cherry (q.v.). It has been introduced in South Africa and elsewhere. The large bladdery persistent calyx turns red, and encloses a yellow fruit from which a not unpleasant jam can be made.

Cape Haytiën, or LE CAP, a seaport of Hayti, on its north coast, 90 miles N. of Port au Prince; pop. 15,000.

Cape Horn, &c. See HORN (CAPE), &c.

Capelin (*Mallotus villosus*), the only species of a genus belonging to the salmon family, and nearly related to the smelt. It is one of the smallest members of the family, lives on the sea-bottom off the northern coasts of the Atlantic, comes to the surface to spawn, and furnishes one of the most important parts of the cod's food in northern regions. Vast shoals occur periodically off Newfoundland, and are much used as bait in the cod-fishery. The capelin is eaten fresh in Iceland, and is sometimes imported in dried form into Britain. The flavour is pleasant, and suggests affinity with herring rather than with salmon.

Capell, EDWARD, Shakespearean commentator, was born near Bury St Edmunds in 1713. He was educated at Bury and Catherine Hall, Cambridge, and in 1737 was appointed deputy-inspector of plays, in 1745 groom of the privy-chamber. His official duties allowed him ample time for his favourite studies, which resulted in 1768 in his edition of Shakespeare in ten volumes, the work of twenty

years. In 1774 he published the first volume of his commentary, but this part was recalled, and the whole published in 1783, as *Notes and Various Readings to Shakespeare* (3 vols.). Capell lived a very secluded life at London and Hastings, and died early in 1781. The best portion of his fine library he bequeathed to Trinity College, Cambridge. He was an acute textual critic, though his abilities are spoken of with contempt by Farmer and Dr Johnson. Others again gave him the credit of many of the notes of Steevens.

Capella, MARTIANUS MINEUS FELIX, a learned author who flourished most probably in the second half of the 5th century, was born in the north of Africa. The work which has preserved his name to posterity is the *Satiricon*, a kind of encyclopædia, highly esteemed during the middle ages as a work of reference. It is written in a medley of prose and verse, and is full of curious learning. Of its nine books, the first two are an allegory, *De Nuptiis Philologiae et Mercurii*, while the remaining seven are devoted to the 'liberal arts': grammar, dialectic, rhetoric, geometry, arithmetic, astronomy, and music. A passage in book viii., that on astronomy, contains more than a hint of the true theory of the solar system. As Copernicus knew Capella, and quotes from him, it has been suggested that probably he derived the first idea of his doctrine from this writer.

Capella, a bright star of the first magnitude, on the left shoulder of the northern constellation of Auriga.

Capelle, EDUARD VON, German admiral, born in 1855 at Celle in Hanover, entered the navy office in 1891, and advocated naval expansion. He was under-secretary in 1913-16, and as secretary 1916-18, in succession to Tirpitz, was responsible for submarine policy.

Cape of Good Hope is not, as often thought, the most southerly promontory of Africa; in reality, it lies half a degree farther north than Cape Agulhas. The Cape (as it is called *par excellence*) is situated 30 miles south of Cape Town, in 34° 22' S. lat., 18° 29' E. long., and is the southern extremity of Table Mountain range and of the Cape Peninsula, which forms the western side of Table Bay in the north and of False Bay in the south. On Cape Point, a precipitous headland near the Cape of Good Hope proper, stands a lighthouse, 840 feet above sea-level. Rounded, perhaps, by the Phœnicians in their 'periplus,' c. 600 B.C. (see Herodotus's *Melpomene*), this 'southern point of Afric's coast,' as Camoens describes it in his *Lusiads*, was doubled and sighted by Bartholomew Diaz (q.v.) in 1487 or 1488—before Columbus, likewise seeking the Indies, but by a different route, discovered America. Fierce gales, such as kept the *Flying Dutchman* out of Table Bay, led the Portuguese mariner to dub the headland *El Cabo Tormentoso* (Cape Tempestuous); but his sovereign, John II., renamed it more happily *El Cabo de Boa Esperança* (Cape of Good Hope). In 1497 Vasco da Gama, following up Diaz's discovery, found his way to India *viâ* the Cape; in 1503 another Portuguese, Antonio Saldanha, landed in Table Bay and climbed the Mountain. Sir Francis Drake, homeward bound in 1580, doubled the Cape, 'the most stately thing and fairest cape we saw in the whole circumference of the world.' The opening up of this ocean-route to India transferred Eastern trade supremacy from Venice and the republics of Italy to the states of western Europe, made the Cape Peninsula a valuable half-way house, and led to the first European settlement in South Africa in 1652 by the Dutch. Thus this Cape gave its name to the Cape Colony, or Colony of the Cape

of Good Hope, since 1910 the Cape Province of the Union of South Africa.

The CAPE PROVINCE, largest and first settled of the colonies forming the Union, occupies the southern end of the African continent, extending eastward from 16° E. to beyond 30° E., and southwards from 25° S. to nearly 35° S.; its area is 277,000 sq. miles, about seven-twelfths of the total area of the Union. On the north-west it is coterminous with the mandated territory of South-west Africa; on the north with the Bechuanaland Protectorate; on the north-east with the Transvaal, Orange Free State, Basutoland, and Natal.

The coast, washed on the west by the Atlantic, on the south and east by the Indian Ocean, curves regularly, like the arc of a circle, with few promontories and inlets. The bays are mostly wide and exposed. The chief harbours are Table Bay (Cape Town), Simonstown on False Bay (the Cape naval station), Mossel Bay, Algoa Bay (Port Elizabeth), and Buffalo Harbour (East London), all on the south coast. Saldanha Bay (on the west coast), the best natural harbour, lacks fresh water; Knysna (S.), a timber port, is narrow of entrance; Port Nolloth (NW.) ships Namaqualand copper; Port St John's (NE.) serves Pondoland. Islands are scanty, small, and rocky. Chief among them are the Ichaboe or Northern group, off the coast of South-west Africa (these, with Walvis Bay, were Cape, not German, territory long before the war of 1914-18), and the Colonial group, scattered along the west and south coasts. Robben Island in Table Bay is a leper settlement; the other islands are uninhabited, but yield guano, seal-skins, and penguin eggs. Perennial rivers are few and non-navigable, with rapids and sand-bars. The most important, the Orange River (q.v.), which separates the Cape from the Orange Free State and South-west Africa, rises in Basutoland and dwindles as it crosses the continent to the sea. Other rivers are the Olifants and Great Berg River (west coast); Breede, Gouritz, Gamtoos (south coast); Great Fish and Great Kei (east coast). Intermittent streams are common in the wet season; rain hollows out deep *spruits* and *dongas*, and causes serious soil erosion. There are no real lakes, but variable *vleis* and salt-pans are formed by rain-water in shallow depressions on the coast and the inland plateaus.

The province consists roughly of an ascending series of plateaus. Beyond a narrow coast belt lies the first terrace (Coast Flats), 500 or 600 feet in elevation. Some 3 to 30 miles inland comes the lowest of several concentric chains of mountains—the Olifants-Drakenstein-Langeberg-Outeniqua ranges, through *kloofs* (ravines) in which rush the rivers of the 'Western Province.' North of the Outeniqua Mountains—midway along the south coast—lies the Little or Southern Karoo (1500 feet), cut off from the Great or Central Karoo, still farther north, by the Zwartbergen, with peaks from 6000 to 7000 feet in height. The Great Karoo (see KARROO) runs east and west for between 300 and 400 miles, and has an elevation of 2000 to 3000 feet. Between it and the Northern Karoo (3000 to 6000 feet), which contains the drainage basin of the Orange River, rises the steep escarpment of the Nieuwveld and Sneeuwbergen ranges, continued north-eastwards by the Stormberg and Drakensberg (or Quathlamba) Mountains, north-westwards by the Roggeveld Mountains. This curving watershed lies from 100 to 150 miles from the coast. Compass Berg, near Graaff-Reinet, in the Sneeuwbergen attains over 8000 feet.

Climate.—The Cape as a whole enjoys an excellent climate, eminently healthy for Europeans. The heat is tempered by cool sea-breezes, and made tolerable by altitude. The high, dry, sun-baked air of the plateaus works wonders with lung troubles.

The coast climate is moister and more equable than inland; in the drier midlands winter is colder, summer hotter; in the higher regions of the interior the extremes are still more marked. Winter (roughly April to September) is the rainy season in Cape Town and the south-western corner; in the eastern, central, and northern regions summer (October to March) brings the rains. The north-west (Namaqualand) is almost rainless; the north and central districts have an annual fall of 5 to 15 inches, the south coastal belt 15 to 25, and the extreme east (Transkeian Territories) 25 to 35 inches. The rainiest regions lie east of Cape Town (35 to 40 inches), round Knysna (40 inches), and along the Pondoland coast (50 inches). Prolonged drought at times afflicts the land. Snow is rare, save on the mountains, but hailstorms are frequent and destructive in summer. Frost is not uncommon inland, where the daily range of temperature is much greater than on the sea-board. The mean annual shade temperature is between 60° and 65° F. practically everywhere, except in the far north and extreme east, which are hotter; but whereas the daily range of temperature averages 17° in Cape Town and 14° in Port Elizabeth, it is as much as 30° in Aliwal North (180 miles from and 4300 feet above the sea) and Kimberley (340 miles inland, 4000 feet above sea-level). In January (the hottest month) the mean maximum temperature is 78·5° in Cape Town and 75° at Port Elizabeth and East London; 84° at Prince Albert (60 miles inland, 2100 feet above sea-level) in the midlands; 91° at Kimberley and 94° at Kenhardt in the north. In July (the coldest month) the mean minimum is 47° in Cape Town, 50° in Port Elizabeth and East London, 40° at Prince Albert, 37° at Kimberley, and 34° at Kenhardt. Cape Town basks in bright sunshine for an average of 7½ hours daily; Kimberley's average is 9½ hours (78 per cent. of the total possible).

Fauna.—The native fauna, formerly so numerous and varied, has been sadly reduced. The lion, the hippopotamus, the rhinoceros, the quagga, the giraffe, once common, have disappeared. Thanks to game preserves and stringent regulations, certain 'royal' or big game have been saved from utter extinction. A few herds of elephants survive in the Knysna forest and Addo Bush. Leopards (called 'tigers' in South Africa) still abound in hilly parts. The spotted serval (Cape Dutch *tijger bosch-kat*), the wild-cat, and the lynx (*rooi-kat*) are among the smaller felidæ. Jackals and wild-dogs (Cape hunting dogs) ravage small stock. The *aardwolf* ('earthwolf') or *maanhaar* ('mane'), a kind of small hyæna, is accused of killing lambs, as are baboons, which in troops rob orchards and mealie-fields. There are no bears. Eland, buffalo, and zebra are all but extinct; these, with bontebok, blesbok, gemsbok, hartebeest, klipspringer, koodoo, rietbok, and wildebeest are protected. Over thirty species of antelope are found in South Africa; some, like the bontebok, are very scarce, others common, like the duiker and steinbok; they range in size from the foot-high blue-buck (*blaauwbok*) and tiny klipspringer to the 1000-lb. eland and the massive koodoo. The gemsbok (oryx) and the vanished black wildebeest (gnu) figure in the Cape coat of arms. The springbuck still 'treks' or migrates, though no longer in the innumerable herds of yore. Among other characteristic animals—some peculiar to South Africa—may be mentioned the wart-hog, the *aardvark* or ant-bear, and the pangolin (scaly ant-eater); dassie (hyrax), Cape badger or ratel, *meerkat* (suricate) or mongoose, *muishond* (polecat), golden mole, Cape mole (*bles-mot*), elephant shrew, spring-hare (*Pedetes Capensis*). Insects and reptiles are all too plentiful. Locust swarms and white ants do much havoc. Among

venomous snakes are cobras and puff-adders. There are over a thousand species of birds in South Africa. Weaver birds, waxbills, louries, and sun-birds are common; long-tailed sugar-birds haunt the Proteaceæ. The wild ostrich survives north of the Orange River. The Cape partridge and Cape pheasant are francolins. The secretary bird is peculiar to the country. The penguin, like the Cape fur seal, frequents the islands off the coast. For Cape fish, see under *Fisheries*.

Vegetation.—Owing to deforestation, bush-cutting, veld-burning, and sheep-rearing, denudation through storm-water, and other causes, South Africa has been undergoing a process of desiccation. Though better provided than the rest of the Union, the Cape is poorly timbered, fires and reckless felling having depleted already scanty forests. Only 1 per cent. of the province is under indigenous forest; virgin timber is almost exhausted. The largest timber forest (area c. 120,000 acres) is at Knysna, in the middle of the south coast. Smaller patches occur on seaward mountain slopes and kloofs from north of Cape Town round to Natal. The trees are chiefly evergreen. Most valuable is the Clanwilliam cypress in the Cedarberg Mountains. Other useful woods—yellow-wood, stink-wood, sneeze-wood, &c.—are utilised for furniture, wagons, railway-sleepers, fence-posts, and similar purposes. The south-west corner of the Cape is scrubland—woodland vegetation with many proteas and shrubs, heaths, bulbous and tuberous plants. The south-eastern region (coast and Eastern Up-lands), with its summer rains, consists of grassland with thorn scrub (chiefly acacias, with aloes, euphorbias, and other succulents). The north-east coast is in the palm belt; the north-west coast is more or less sandy desert. The heart of the province is Karoo, a desert-like region devoid of trees and shrubs. Here mesembryanthemum, crassula, aloes, and other succulents prevail, with tuberous and bulbous plants; prickly pear has spread broadcast. Rain, like a magician's wand, transforms the dull, flat basin into a glorious glowing carpet (due to various marigold-like flowers called 'goudsbloem'). The Northern Karoo is a great, treeless, elevated expanse, dotted with flat-topped hills. It grows shrubs and bushes, and turns a magenta colour when the *Mesembryanthemum spinosum* is in flower. North of latitude 30° S. the Karoid plateau meets grassland (veld topped with short, wiry grass), which stretches away to the Kalahari and Rhodesia. The Cape Peninsula is one of the richest regions in the world for flowers. On Table Mountain grow orchids (e.g. red and blue disas), watsonias, gladioli (e.g. the perfumed brown Afrikaner lily), ixias, nerines, anemones, and hundreds of beautiful flowers and heaths. Caledon (90 miles from Cape Town) boasts 300 or 400 varieties of heath, and its annual wild-flower show is unique.

Industries.—Farming is the chief industry, about a third of the male European population and the vast majority of the natives being engaged therein. Although mining products still account for the major share (in value) of South African exports, agricultural and pastoral produce has substantially augmented its proportion within the present century. Cultivated land, while extending, forms but a tiny fraction of the total farm-land in the province. The pastoral branch of the industry far exceeds the agricultural and horticultural side. The irrigated area is being increased by irrigation boards with the aid of government loans. Van Wyk's Vlei dam (Carnarvon district) and various Oudtshoorn works served as pioneers; more recent undertakings on a big scale are the Olifants River (Van Rhynsdorp), Kamanassie River (Oudtshoorn), Nels River (Oudtshoorn), and Sundays River

(Uitenhage) schemes. 'Dry farming' is also making headway in regions where the rainfall is scanty. Thanks to better implements, more scientific methods inculcated by the Union Department of Agriculture, and co-operation, notwithstanding locusts, East Coast fever, ticks, scab, drought, and the thousand and one enemies of the farmer, the country has been converted in a very few years from an importer to an exporter of many food-stuffs. (As an instance in point, the Union imported in 1913 over 20 million eggs; in 1921 it exported as many.)

Domestic Animals.—Sheep-breeding is the oldest and most general pastoral industry, few parts being unsuited therefor, although farms with abundant summer and winter natural grazing are exceptional. Sheep flourish on the Karoo vegetation, but have often to be trekked or driven to fresh pasturages. The native Cape sheep (Afrikander) is particoloured, has long lop-ears, a fat tail (6 to 10 lb. in weight), and wiry hair instead of wool. Merinos and other breeds were imported from Holland, France, and England, and wool began to be exported early in the 19th century. To-day it ranks next to gold among the Union exports. The quantity shipped in 1921 (230,422,000 lb.) was almost double the figure for 1910. Of this 95 per cent. was grease wool, only 5 per cent. being scoured. The Cape restocked the Transvaal and Orange Free State after the Boer war in 1902, and (with 10,500,000 woolled and 3,000,000 other sheep in 1920) still owns half the sheep in the Union. Woolled sheep tend to increase, native sheep to decrease in numbers. Disease, drought, locust ravages, and the abattoirs severely reduced flocks after 1912, when there were 13,000,000 woolled and 6,000,000 other sheep. Scab, kraaling (enclosing in pens), and slovenly methods affect both quality and quantity of wool, and dirty wool has kept down prices. Jackals, the cause of kraaling, are being fought by fencing; scab is combated by compulsory dipping and quarantine, but trekking flocks spread infection. Over 5,000,000 sheep-skins were exported in 1920. A large import trade in mutton has given place since the Union to an export trade, which should grow as the non-woolled Cape sheep is improved by crossing with imported breeds. The Cape woolled sheep are inferior to Australian sheep, though good Cape stud flocks rival those of the Commonwealth. Sheep farms are very extensive, breeders in the Karoo owning as much as 20,000 to 50,000 morgen (a morgen equals 2·116 acres).

The ox in South Africa was long regarded not as so much butcher meat, but as a draught animal or—to the native—a unit of wealth and barter. Afrikander trek-oxen are unrivalled, but railways and motor-traction are putting many on the retired list, and farmers are now paying more and more attention to cattle for slaughter and dairy purposes. Drought, the Boer war (1899–1902), rinderpest, and other plagues combined to thin South African herds, and huge quantities of frozen meat were imported annually. In the first decade of the Union not only was Argentine beef 'frozen out,' but the foundation of an export trade was begun. However, after the Great War it was realised that the quality of South African beef must be improved ere it could gain a secure hold on the English market. By importing sires, improving breeds and feeding methods, a marked advance has been effected of late in the quality of Cape cattle, although in numbers a big drop was recorded (1,600,000 in 1920, as against 2,700,000 in 1911). Before unification (1910) a heavy importer of dairy produce, South Africa now supplies its own needs, and exports large quantities of butter and excellent cheese. Hides also form an important

export item (though bad branding too often lowers the value), and supply raw material to Cape tanneries and the active local leather industry. Friesland are favoured in the west, shorthorns in the east. The Afrikander has a decided hump, large dewlap and long wide-spreading horns, yields poor beef, little (but rich) milk, and is a splendid draught animal. East Coast fever ravages natives' herds in the Transkeian Territories, otherwise excellent cattle country.

Ostrich domestication began about 1860, but little progress was made for another decade, when incubators were introduced. A 'boom' in the early 'eighties was followed by a ruinous slump. After the war of 1899–1902 prices soared anew, and by 1913 the domesticated birds numbered 757,000, having more than doubled in ten years. Then over-production provoked a fresh slump, which the Great War and vagaries of fashion accentuated. By 1920 flocks had been cut down to 277,000, only birds of superior plumage being preserved. In the record year 1913 over 1,000,000 lb. of feathers, valued at well-nigh £3,000,000, were exported from South Africa (practically all from the Cape). The average value per pound fell to 16s. in 1915, as against £5, 8s. in 1880. The chief ostrich districts are Oudtshoorn, Graaff-Reinet, and round about Grahamstown in the Eastern Province. The birds are kept in large fenced camps, or fed in paddocks on lucerne, to grow which irrigation has been freely adopted. The perfection of plumage through selective breeding, the absence of cruelty in clipping the birds, the virtual monopoly enjoyed and jealously guarded by South Africa, ensure the success, despite set-backs, of ostrich-farming in the Cape, whose two most valuable exports are (rather precariously) both articles of luxury and adornment—diamonds and feathers (see OSTRICH).

Angora goats were first imported from Asia Minor in 1838. The herds multiplied till, by 1912, the Angoras exceeded 3,668,000. Drought brought this total down by half in 1920. Exportation of mohair began in 1857, and in half a century rose to over 20,000,000 lb., valued at £1,000,000. South Africa supplies the major share of the world's needs in mohair; most goes to Bradford. Cape mohair is less fine than Turkish, but more attention is now being paid to stud flocks. Other goats are raised profitably for mutton and skins, especially in the dry north and north-west and districts where sheep do not thrive. Horses are not indigenous, but Arabs were introduced from Java in the 17th century. Soon horse-breeding was taken up; from 1769 onwards remounts were exported, and Cape racers became famous in India. The Karoo offers a favourable breeding-ground, but deadly 'horse-sickness' prevails in some regions, and 'salted' (i.e. immune through having had and recovered from the disease) and inoculated horses are in demand. Excellent mules are also bred for export, or to take the place of oxen when faster draught animals are needed. Asses are reared in Bechuanaland, and do well where horses cannot live.

Cultivated Plants.—Maize is the chief grain crop. Mealies, to use the Cape name, are the staple food of the natives, yield a more certain crop than other cereals, and have an unlimited market at home and abroad. Since 1907 a big export trade has been built up (in 1921, 1,000,000,000 lb. of maize and maize-meal were shipped from Union ports, valued at £5,000,000). The best Cape maize-region lies inland east of Port Elizabeth. By the erection of grain-elevators at the ports and in the maize-districts, production is being stimulated. Kaffir-corn (sorghums and durras), more suited to drier regions, provides the natives with food and drink (Kaffir beer), and is also used as fodder or for ensilage. Wheat grows well in some south-western

districts; oats are a more general crop, being sown largely for hay, and in poorer soil. Rye and barley are also produced. Malmesbury is the chief grain-district.

Tobacco (Virginian) for pipe-smoking and cigars has long been grown in Oudtshoorn and Stockenström districts in the east, Piquetberg in the west; since 1905 Turkish tobacco has been successfully introduced in the French Hoek and Drakenstein valleys near Cape Town, and colonial Turkish cigarettes have ousted the imported article. Wattles are planted in the Transkeian Territories, and their bark (yielding valuable tannin) is exported. Cotton, tried before in the eastern coast regions, is being experimented with afresh.

The country is highly favoured in the matter of fruit. The climate stimulates home consumption, and Cape soft fruit, reaching London in winter, has the market to itself. The first half of the year sees the deciduous fruit of the Western Province ripen—luscious peaches, plums, nectarines, apricots, pears, and grapes. The second half of the year brings the citrus fruits—oranges, naartjes, lemons—and pineapples of the Eastern Province, besides Stellenbosch strawberries. With figs, guavas, quinces, apples, loquats, Cape gooseberries, melons, and what not, these make the fruit season last the year round. Ever-increasing quantities are being canned and bottled, made into jam and jelly, or dried (peaches, apricots, and prunes; currants and raisins). The export trade, begun at the end of the 19th century, is expanding rapidly; additional cold-storage is demanded; and orange-growing in particular has attracted attention since the Great War ended.

The vine was introduced—for brandy—by the first Dutch settlers, and the wine industry, the pioneer industry of South Africa, was established by the Huguenots (1689) in and around Paarl and Stellenbosch. Wine-farmers prospered; Cape wines—especially Sweet Constantia (port)—won a name for themselves in England and Europe, and by the mid-19th century a big export trade was carried on. Nearly a million gallons were shipped in 1858. The withdrawal of colonial preference by the United Kingdom in 1860, the reduction of duties on French wines, the outbreak of phylloxera (1886), and the Cape farmers' fatal proneness to put quantity before quality combined to kill this flourishing export. The introduction of new stocks from America and better methods gradually improved matters, and good light wines (chiefly white) are now produced; half a million gallons were sent overseas in 1920, colonial preference having been restored. Brandy production has also greatly increased since the Union, and pernicious 'Cape smoke' or *dop* (brandy distilled from husks) is being driven out by excess excise duties. Raisins and currants and vinegar are also made, and delicious table grapes exported in huge quantities.

Minerals.—The discovery of diamonds (at Hope-town, on the Orange River) in 1867 altered the whole history of the Cape. Drought and depression threatened the land with bankruptcy when this unsuspected source of untold wealth was revealed. In like manner, some twenty years later, the shadow of disaster was dispelled in South Africa by the discovery of the Rand gold-mines. Diamonds, however, differ from gold in being a luxury, not a necessity with a standard value. Their price is liable to sudden and violent fluctuations. Only by carefully regulating the supply can high prices be maintained. Hence, not satisfied with amalgamating (1891) the Kimberley mines in the De Beers Consolidated Mining Company, which to-day controls practically the entire output of South African diamonds, thereby enjoying a world monopoly (Brazil and Belgian Congo stones are the only competitors of consequence), Cecil Rhodes founded the

London Diamond Syndicate (1893) to purchase all South African stones, and control prices and quantities put on the market. World crises always hit the diamond industry hard. The depression of 1907 in America and Europe reduced the output of Cape diamonds in value from six millions to three millions sterling. The outbreak of war in 1914 brought it down from seven millions (1913) to quarter of a million (1915). The post-war trade-slump and flooding of the market with stones sold by Russians and other ruined Europeans led to the temporary closing down of the Kimberley mines in 1921, and a drop from the record production of 1,364,706 carats, valued at £9,500,000 in 1920, to 238,470 carats, worth but £1,300,000 in 1921. The river diggings, which began in earnest at Klipdrift, near Barkly West, on the Vaal, in 1870, were soon completely overshadowed by the discovery of great diamond pipes in the dry fields, in the midst of which Kimberley (q.v.) rose like a mushroom. Primitive surface diggings in time gave place to open works 500 feet in depth and underground shafts six times as deep, costly machinery, and highly scientific methods of recovery. In 1920 over 31,000 men (10 per cent. of them white) were employed in diamond-seeking—half in Kimberley mines, and half in the alluvial diggings. Alluvial stones fetch two or three times as much per carat as the less pure mined stones; Cape mine stones are twice as valuable as Transvaal mine diamonds of the same weight. In 1919 alluvial stones touched the record price of 261s. 6d. per carat, as against 87s. 10d. for Cape mine stones (which before the war fetched about half that price). Alluvial stones represent approximately a tenth of the total South African production. In half a century (1870–1920) the Cape diamond output totalled roughly 100,000,000 carats, valued at £200,000,000, the record year (for weight, not value) being 1906, when 2,742,868 carats, worth £7,000,000, were exported. In 1917 an export duty was imposed on rough diamonds, with a view to transferring the lucrative industry of diamond-cutting to South Africa (see DIAMOND).

Copper, the first metal worked by Europeans in South Africa, ranks next to diamonds among Cape minerals. The only productive mines are in the north-west corner of the province, in Namaqualand, where ore was discovered as early as 1685. Working began in 1852 at Springbokfontein, and in seventy years copper to the value of some £20,000,000 was extracted (mainly by partial pyritic smelting) from the mines near O'okiep (mostly by the Cape Copper Company and the Namaqua Copper Company), and taken by rail to Port Nolloth, 90 miles away. Extraordinarily rich in the past, the first-grade ores were nearing exhaustion when the war began in 1914, and in 1918–19 the heavy drop in prices led to the suspension of productive operations. Copper also occurs at Mount Ayliff (East Griqualand) and in Hay, Gordonias, and Prieska divisions in the far north.

Asbestos has, since 1893, been produced in the Hay and Prieska districts, near the Orange River, and still farther north at Kuruman and Barkly West. The first thirty years of working the deposits yielded some £600,000 worth of asbestos, the output rising to 3000 or 4000 tons, valued at over £20 per ton. The Cape 'blue asbestos' (asbestiform crocidolite) fibre, at first viewed askance, is now acknowledged superior for the manufacture of certain articles.

Coal outcrops in the Stormbergen, and is worked chiefly at Indwe (Wodehouse), Engcobo (Tembuland), and Cyphergat (Molteno). This coal proved very useful in the early days of the diamond-mines and railway development. The output rose to 200,000 tons by 1900, but in the next twenty years shrank to 5000 tons. Yielding poor coal, and

expensive to work, the Cape mines cannot compete with other South African mines since opened, and now only supply local needs.

Gold has been found in different parts of the province, notably at the Millwood diggings (Knysna) and small mines near Mafeking, but the output is trifling. Tin (cassiterite) is worked at Kuils River (16 miles from Cape Town). Granite, iron ore, corundum, lime, salt (from 'pans') also contribute to the mineral production. Nickel occurs at Insizwa. Crocidolite (cat's eye, or hard *chatoyant* variety) is found plentifully at Naauwport, west of Kimberley, and is exported for jewellery purposes.

Fisheries, though fish abound along the coast, are not fully developed. The Agulhas bank is said to be one of the finest fishing-grounds in the world, sole being plentiful. Staple fish are silver fish, 'Hottentots,' pangas, red stumpnose; geelbek and kabeljauw (a kind of cod), both called 'Cape salmon,' and stockfish (hake) are migratory. Snoek (barracouta), once most common, is salted and sent to Mauritius. Steenbras (stone bream) is the biggest edible fish. Sharks abound. Crayfish swarm in Table Bay, and are now canned and exported in millions. Many rivers have been successfully stocked with trout. Cape whaling stations capture hundreds of whales yearly, and whale-oil is shipped to England. The government guano islands yield in good years as much as 10,000 tons of valuable guano, in great demand as a fertiliser; over 10,000 seal-skins have been secured in a season; and from Dassen Island 500,000 penguin eggs.

Manufactures, while increasing steadily, are yet comparatively unimportant. In 1920 3000 factories were in operation, employing 63,000 persons (mostly coloured); half of these worked in the Cape Peninsula, and one-tenth in Port Elizabeth, the only other industrial centre of note. Most of these industries are dependent for their raw materials on Cape farming, forestry, and fisheries—e.g. wine, brandy, jam, leather, and tobacco industries; wagon-building and furniture; fish-curing, crayfish-canning, whale-oil extracting. Other manufactories import raw materials to supply mines, railways, and farms with machinery, explosives, &c., or to satisfy everyday needs (tailoring, printing, chemical-works, building and contracting). The great mass of its manufactured articles the Cape still gets from overseas. There is a dynamite factory at Somerset West. Uitenhage has railway workshops and wool-washeries. As agriculture progresses, population increases, cost of living decreases, and transport arrangements are improved, local manufacturing industries are bound to take a fairer share in the country's development.

Communications.—Country roads are managed by the provincial administration, and divisional councils can levy local road rates. The mileage of main and other roads is rising rapidly; the ox-wagon still goes its leisurely way from outspan to outspan (unyoking-place), but the motor-car is invading even the back-veld. Bridges are superseding *drifts* (fords); several span the Orange River, linking the Cape and the Orange Free State. Railways have forced their way into the remotest regions of the province, ousting the 'kurveyor' or transport-rider. These are almost all Union government property. The first line, Cape Town to Wellington, 58 miles in length, was built in 1859-63, and was taken over by the Cape government in 1873. By 1883, thanks to the discovery of the diamond-fields, the Cape railway system had extended to over 1000 miles, a total which had quadrupled by 1915, when to facilitate military operations the line was carried across the Orange at Prieska and rapidly linked up with the railway in (then) German South-west Africa at Kalkfontein—a stretch of 315 miles across most trying

country. The main line from Cape Town reached Kimberley in 1885, Bloemfontein in 1890; two years later Johannesburg was connected by rail not only with Cape Town, but also with the rival ports, Port Elizabeth and East London. The 'Cape to Cairo' line pushed on from Kimberley to Mafeking in 1894, then crossed the Bechuanaland Protectorate and Rhodesia to the Belgian Congo, with Lake Tanganyika as next objective. Lateral railway extension neglected in favour of lines from the coast to the inland mines) is now in full swing in the Cape Province. The only isolated line is the Cape Copper Company's track from Port Nolloth to O'okiep. Save in the case of a few private or branch lines the gauge is 3 feet 6 inches. The rivalry of Cape, Natal, and Portuguese East Africa ports, and the difficulty of adjusting satisfactory railway rates for the Rand traffic, long caused inter-colonial friction, but ultimately helped to hasten the Union of South Africa. The Union shipping line, which amalgamated with the Castle Company in 1900, carried the English mails from 1857. The first telegraph line (Cape Town to Simonstown) was opened in 1860. Cables of the Eastern Telegraph and associated companies connect the Cape with Britain, Australia, South America, India, and the Far East. Wireless stations have been erected at Slangkop (Cape Peninsula) and Port Elizabeth.

Administration.—The Cape Province consists of (1) the Province proper (including, for administrative purposes, Bechuanaland); (2) Transkeian or Native Territories (composed of East Griqualand, Tembuland, Transkei, and Pondoland); (3) Walvisch or Walvis Bay (q.v.). The Cape (with its Native Territories) elects directly to the Union House of Assembly fifty-one members, who, with the Cape provincial council, nominate eight members of the Union Senate. The chief executive officer of the province is an Administrator, appointed by the Governor-general in Council and aided by an executive committee of four, elected from and by the provincial council. This council, also consisting of fifty-one members, is elected for three years (by the Union parliamentary constituencies), meets in Cape Town—like the Union legislature—and passes ordinances dealing with purely provincial affairs, and taxation therefor—e.g. school education (till assumed by the Union Parliament), hospitals, municipal institutions and divisional councils, roads, bridges, markets, fish and game preservation. In the Cape, more advanced than the rest of the Union, there is no colour bar as regards the franchise, and non-whites may be—and are—elected to the provincial council. All national affairs are under control of the Union parliament. (See SOUTH AFRICA.)

Local Government.—The Province proper is partitioned into some ninety fiscal divisions (of unequal extent) under divisional councils, which manage local roads, bridges, rating, public health, &c. Instituted in 1855, these councils control rural affairs, and do not exist in the other provinces of the Union. There are 120 municipalities in the Province proper, and 7 in the Native Territories. Some of these are tiny *dorps* of but 500 or 600 inhabitants, white and coloured. Smaller local units are under village management boards.

Herschel division, next Basutoland, is administered by a magistrate under the Native Affairs Department, as is Glen Grey (adjoining the Transkeian Territories), which, like nearly all districts in the territories, has also a district council, consisting of native members with the resident magistrate as chairman. Representatives of the district councils in the Transkei, Tembuland, and East Griqualand unite annually in the Transkeian Territories General Council, with the chief magistrate as pre-

sident; those in Pondoland unite in the Western Pondoland General Council. These councils are advisory, and give natives a voice in such matters as education, roads, public health. The Union Native Affairs Act of 1920 provides for the extension of this system of local native councils, first introduced by Rhodes's Glen Grey Act (1894).

Population.—The following table gives the total population and the white population of the Cape Province and its component parts at the 1921 census:

	Area, sq. miles.	White Pop.	Total Pop.	Total 1911.
Cape Province proper	208,661	613,766	1,693,988	1,568,150
Bechuanaland . . .	51,524	20,642	119,678	99,553
Transkeian Territories (16,351)	(16,351)	(14,726)	(963,131)	(894,186)
East Griqualand . .	6,602	6,258	264,786	243,222
Tembuland . . .	3,339	4,695	235,479	227,432
Transkei . . .	2,504	2,278	197,911	188,895
Pondoland . . .	3,906	1,500	264,955	234,637
Walvis Bay (and Travellers) . . .	430	2,420	4,398	3,076
Cape of Good Hope .	276,966	651,554	2,781,185	2,564,965

(1) *White Population.*—The 1921 census thus recorded a total population of 2,781,185, of whom 651,554 were European or white. When the first census was taken in 1865, the whites numbered 182,000; by 1891 this figure was doubled; the 1911 total was 582,000. The European inhabitants are outnumbered by more than three to one. They are divided among themselves into two sections, whose mother tongue is English and Dutch or Afrikaans respectively (many are bilingual, especially those of Dutch descent). Eight out of nine are African-born (Afrikaners); immigration proceeds slowly. Immigrants from Europe are generally townsmen; Dutch Afrikaners or Boers are mostly farmers. Males outnumber females, but the margin is no longer great. More than half the whites attend Dutch churches; Anglicans come next in numbers, then Methodists, Presbyterians, Roman Catholics, and Jews. There is no state church. Dutch colonials predominate in the rural districts, English in the larger towns. Cape Town, Port Elizabeth, Kimberley, and East London are the only urban areas with over 10,000 white inhabitants; except Grahamstown, King Williamstown, Oudtshoorn, Paarl, Queenstown, and Uitenhage, other towns have less than 5000 Europeans. *Dorps* (villages) are scattered broadcast.

Education.—Higher education is controlled by the Union government. Since 1918 Cape Town and Stellenbosch (a Dutch divinity and law centre) have universities; Huguenot University College (Wellington) and Rhodes University College (Grahamstown) are among the constituent colleges of the University of South Africa (which succeeded the examining University of the Cape of Good Hope). School education remains under provincial control till the Union parliament decrees otherwise. In the Cape the schools for white children are under local school boards; between seven and sixteen (or till Standard VI. is passed) education is compulsory; primary education up to Standard VI. is free. The percentage of attendance (over 90) is high, considering the distances involved.

(2) *Coloured Population.*—The other-than-white or non-European population—2,130,000 in 1921—consists of Bantu and other natives, Eurafrikaners and others of mixed race, and Asiatics. Half the coloured population live in the Cape Province proper, half in the Transkeian Territories and Bechuanaland, the addition of which to the old Colony profoundly altered the ratio of white inhabitants to coloured. In the Province proper there are three Europeans to every five non-Europeans; in the

Territories natives outnumber whites by sixty-eight to one. More prolific, the natives are increasing faster than the white inhabitants. No longer decimated by inter-tribal wars and wars with Europeans, the Bantu, instead of disappearing like the coloured races of other British Dominions, multiply at a rate which complicates the already intensely difficult native problem of South Africa. With the introduction of better hygiene, and the reduction of the high infantile mortality rate, this tendency to outdistance the white population will be accentuated, failing a heavy influx of white settlers from overseas.

The Cape natives are nearly all Bantu of various nations. In the east (Transkeian Territories) are Xosas, in the north Bechuanas. The chief tribes of the Ama-Xosa (*Ama*=people of, men of) are the Ama-Mtembu (Tembus or 'Tambookies'), the Ama-Gcaleka (Galekas), the Ama-Rarabe (including the Gaikas or Ama-Ngquika), and the Ama-Mpondo (Pondos). According to tradition, Zwile (*A.* 1500) had three sons, Mtembu, Xosa, and Mpondo, who divided their father's tribe and founded separate branches of the Ama-Xosa. These made their way southwards from the lake regions of Central Africa, and reached the Kei River before the end of the 17th century. The brothers Gcaleka and Rarabe were descendants of Xosa, and their tribes figured most prominently in the border wars of the 18th and 19th centuries. The Tembus farther inland, and the Pondos farther up the east coast, suffered severely at the hands of Tshaka and his merciless Zulu *impts*. The Ama-Fengu or Fingoes ('wanderers') were also victims of Tshaka, being driven from Natal, scattered, and forced to seek refuge among the Xosas. The Xosa yoke they found so heavy and galling that from 1834 they threw in their lot with the British in the Kaffir wars, and some were settled within the bounds of the Cape Colony. The Fingoes served as a sort of buffer between their white allies and their Xosa foes. Still viewed somewhat askance by their fellow-blacks, the Fingoes have, as a rule, shown more aptitude for education and European civilisation than the other Bantu tribes of the Cape.

Before the Ama-Xosa took possession of the Transkeian Territories another group of Bantu invaders from beyond the equator had established themselves in the interior, in the north—the Bechuana. In that part of Bechuanaland which is included in the Cape of Good Hope (British Bechuanaland—as distinguished from the Bechuanaland Protectorate) the Bechuana nation is represented mainly by the Batlaping and the Barolong tribes. The Batlaping followed the Bakalahari south into the central plateau and drove them into the Kalahari desert, and then in turn were ousted by the Barolong. Moffat opened a mission-station at Kuruman among the Batlaping. Lacking the bravery of the Xosas and the Zulus, the Barolong were terrorised by Moselekatse and his Matabeles. Montsioa of Mafeking, the Barolong chief, fearing Transvaal aggression, appealed for British protection, which followed Sir Charles Warren's expedition of 1884–85, thus keeping open for the British Empire the road to the hinterland of South Africa, to which Cecil Rhodes's far-seeing eyes were turned.

Natives other than Bantu include Hottentots, such as the Namaquas and the Korannas, and a sprinkling of Bushmen in the remote north-west (Bushmanland). Griquas (Hottentots of mixed descent, with an infusion of European blood) fled north to escape from the early Dutch settlers at the Cape, and installed themselves near the junction of the Orange River and Vaal (Griqualand West). Hence, owing to difficulties with the Orange Free State, Adam Kok and his Griquas were transferred by Sir

George Grey in 1861 to Griqualand East, between Pondoland and Basutoland.

About a fifth of the non-European population is of mixed race. Eurafricans—or 'coloured people,' as they are often called, in contradistinction to natives and Asiatics—are chiefly congregated in the Cape Peninsula and south-western districts and in the larger towns. Very few are found in the Native Territories. Asiatics, who number several thousands, comprise chiefly (1) virtually indigenous Malays, resident in the Cape Peninsula, descendants of slaves introduced by the early Dutch settlers; and (2) Indian immigrants. Chinese have been excluded since 1904, and as the Union Immigration Law admits from overseas no male Asiatics over sixteen, this section of the community is dwindling.

Religion and Education.—Of the non-European population nearly half (including practically all those of mixed race) are classed as Christian. Among the Bantu the Wesleyan Methodists have most adherents; among the 'coloured people,' the Dutch and Anglican Churches. The separatist African Methodist Episcopal or Ethiopian Church makes marked headway. The first mission sent to South Africa was Moravian (1737); the pioneer Moravian station, Genadendal, some sixty or seventy miles east of Cape Town, dates from 1792. The London Missionary Society entered the field soon afterwards; John Philip, John Mackenzie, the Moffatts, Livingstone, among others, worked for this society, especially among the Bechuana. James Stewart made Lovedale (q.v.) pre-eminent in South Africa among institutions providing 'higher education' to the native. For long native education was left entirely to missionary effort. White and coloured pupils have separate schools. There are now over 2000 state and state-aided schools for coloured children in the Cape, with some 150,000 scholars (two-thirds being Bantu). About one-tenth of the natives can read and write, and about a fourth of the mixed coloured population. The Territories evince a growing desire for secular schools. To satisfy demands for higher education for non-Europeans the South African Native College was opened in 1917 at Fort Hare, near Lovedale, in Victoria East division. This is intended to provide coloured students of all races with education of university standard, and train them for the learned professions and higher branches of agriculture, commerce, &c. Natives already range in civilisation from raw savages to university graduates and accomplished newspaper editors, publicists, preachers, and teachers, and the whole question of native education, higher and elementary, is one of the most difficult South Africa has to solve.

History.—The history of Cape Town was long the history of the Cape; the history of the Cape was long that of South Africa—indeed, the two terms are still often used synonymously. Three coloured races and three white races have in turn played their part in the story. The original inhabitants, the Bushmen (or *Sana*), dwarfish hunters, fleet of foot, skilful with bow and poisoned arrows, retired before the dumpy Hottentots, but left behind them remarkable drawings on the walls of caves—the earliest extant Cape records. The Hottentots (*Khoi-khoi* = men of men), nomad pastoral tribes, were in possession when the first white men arrived in Table Bay. Down on these primitive inhabitants swept Bantu hordes from the north—the so-called Kaffirs who now constitute the native population of the Cape. Squeezed between white invaders advancing from the south-west, and black invaders encroaching from the north-east, the yellow-skinned Hottentots and Bushmen had no chance; to-day pure specimens of these races are very rare, and are to be found

only in remote Namaqualand or the Kalahari desert. The Bantu were superior not only in numbers, but in physique and civilisation, being agriculturists and artisans as well as warriors.

The Portuguese discovered the Cape; the Dutch colonised it; the British conquered it. No attempt to occupy South Africa was made by the Portuguese. Diaz, Da Gama, Saldanha came and saw—and departed. Diaz landed in Algoa Bay (Algoa means 'to Goa,' just as Delagoa means 'from Goa') in 1487-88; Vasco da Gama anchored in St Helena Bay and Mossel Bay in 1497; Saldanha entered Table Bay in 1503. But the death of D'Almeida, Viceroy of India, in 1510, at the hands of Hottentots near Table Mountain, gave the Cape a bad name, and made the Portuguese confine their attention to East and West Africa.

The foundation of the English and Dutch East India Companies (1600, 1602) opened a new chapter in Cape history. Dutch and English Indians regularly put into Table Bay for water, and to leave and take up letters hidden near inscribed 'Post-office stones.' In 1620 Captains Fitzherbert and Schillinge hoisted the English flag on Signal Hill (at the foot of which Cape Town was to arise), and annexed 'the whole continent near adjoining' in James I.'s name. Unfortunately their act was never ratified, and it was left to the Dutch to establish the first European colony in South Africa. In 1652 the worthy Johan van Riebeeck, a surgeon, founded Cape Town for the Dutch East India Company, as a station where their ships could get fresh meat and vegetables, and their sick receive attention. Steadily the station grew in population and area under a succession of governors, most notable among whom was Simon van der Stel. During his régime (1679-99) agriculture and tree-planting were encouraged, Government Avenue and Gardens were laid out, the Namaqua copper mountains were explored, Stellenbosch was founded, and a couple of hundred Huguenot refugees were settled (1688-90) in and around French Hoek. These new-comers made an appreciable addition to the European colony; they promoted viticulture; and, though they had to give up their French tongue, they founded some of the most outstanding and enduring families of South Africa (e.g. De Villiers, Malan, Marais, Joubert). Under Adriaan van der Stel, who succeeded his father as governor, discontent shook the settlement, and he was recalled by the company in 1707. Many Asiatic and African slaves had been imported, and half-castes of all shades—'Cape people'—were added to the community.

Penetrating ever farther inland, the pioneers came more and more in conflict with Hottentots and Bantu. Smallpox, which ravaged the Colony in 1713, swept away many surrounding Hottentots, and their territory was taken over by the white settlers. Under Swellengrebel, the first South-African-born governor, Swellendam was founded (1746). In 1756 the white population, swept afresh by smallpox, numbered little over 5000. The governorship of 'Father' Tulbagh (1751-71) ushered in what has been called the Golden Age of the Cape. Such were the growth and display of wealth that sumptuary laws had to be imposed. By 1770 the white population had risen to 10,000. Cape Town gave itself airs as the 'Paris of the South.' The declining Dutch East India Company's selfish and repressive rule, however, drove many settlers to trek inland. In the north the Orange River was explored, and named after the Stadhouder of Holland. The Fish River was declared (1778) the eastern boundary, and Kaffir wars ensued (1779, 1789). War between Britain and Holland (1780) added new complications, and gave the finishing blow to Dutch East India Com-

pany rule. The States-General of Holland, taking over the government of the Colony, sent out a commission of inquiry. When the Prince of Orange fled to England and the Batavian Republic sided with France, a British force in 1795 occupied the Cape. Liberty was extended and prosperity restored ere it was handed back to the Dutch in 1803, after the Peace of Amiens. For three years wisely administered as a Netherlands colony, and no longer exploited by a grasping company, the Cape was soon to pass once more into British hands—this time for good. Hostilities were renewed between Holland and Britain. A British force under Sir David Baird landed in Table Bay, and at Blaauwberg, 18 miles from Cape Town, defeated a motley Dutch army, under General Janssens, on 8th January 1806. Cape Town capitulated, and in 1814 British possession was finally recognised by the Netherlands, which received £6,000,000 in return for this and other territory. When the Cape was thus permanently ceded to Britain, the population of the Colony consisted of 26,700 whites, 29,000 slaves, and 18,000 free Hottentots.

Cape Colony, 1807–1910.—The clash of races provides the *motif* of Cape history in the 19th century; the conflict of black and white, of white and white, of black and black explains most of the failures and successes of the Cape of Good Hope from its inception as a British crown colony in 1807 till it was merged in the Union of South Africa in 1910 as an original province thereof. Six Kaffir wars (1812, 1818, 1835, 1846, 1850, 1877) were waged on the eastern frontier of the Colony, where Grahamstown became the military headquarters; the home government vacillated in policy, the pioneer settlers suffered severely, but the bounds of the Colony were pushed ever farther east. Outstanding events of this protracted strife were the landing of 5000 British immigrants (the 'Albany Settlers') at Port Elizabeth in 1820—the nucleus of that portion of the Colony which became known as the Eastern Province as distinguished from the Western Province, whose *point de départ* was Cape Town; the great Kaffir Rebellion of 1850–53; the wholesale killing of their own cattle and neglecting of their fields (1857) by Xosas deluded by a witch-doctor's predictions of a kind of Kaffir millennium—this led to the depopulation of Kaffraria by starvation or migration and its repopulation by whites (including many Germans), the rise of East London and King Williamstown, and the incorporation in the Colony of British Kaffraria—between the Keiskama and Kei rivers—in 1865, another stage in the *Drang nach Osten*, which ended only in 1894 when Pondoland became part of the Colony, and the last gap between the Cape and Natal was closed. Since 1877 the history of the Cape has, compared with some of its neighbours, been singularly free of native risings. This may be attributed to its more generous native policy. Among the first acts of the British administration were to prohibit the slave trade (1807), to emancipate those in the Colony (1834), and to put all free coloured people on a level politically with Europeans (1829)—the native *Magna Carta*, as it has been called. Cecil Rhodes advocated 'equal rights for all civilised men south of the Zambesi' regardless of colour, and his extension of a measure of self-government to the Native Territories, by the Glen Grey Act (1894), made for peace between black and white, and set an example to South Africa as a whole.

While black struggled desperately with white in the east, white contended bitterly with white in the west. British rule inevitably roused Boer discontent. Conservative and jealously independent, the descendants of the first Dutch settlers resented not only the arbitrariness of imperial governors and the ignorance of a remote British

government, but salutary reforms as well. The new régime enforced gentler methods of treating the native, freed slaves with inadequate compensation and disastrous results to their owners, imposed English as the official language (1828: Dutch was not recognised in the Cape parliament till 1882), substituted civil commissioners and resident magistrates for *landdrosts* and *heemraden* (1828), and so inflamed Dutch indignation that an abortive rebellion took place in 1815—its stern suppression at Slachters Nek causing much bad blood for generations to come—and twenty years later 10,000 *voortrekkers* set off heroically, in bullock-wagons, to find freedom in a new world beyond the Orange River. This Great Trek (1835–38) led to the foundation of Boer republics in Natal, the Transvaal, and the Orange Free State. When Natal was proclaimed British in 1843 racial bitterness became still more intense, and a new grievance was created for the Dutch colonists—the non-possession of a sea-board. In the Cape itself Anglo-Dutch rivalry was largely a question of east (predominantly English-speaking) versus west (still mainly Dutch-speaking), of town versus country; in South Africa it was a question of British coast colonies versus inland Boer republics. The discovery of diamonds in 1867 introduced a new line of cleavage; mining displaced farming as the 'backbone' of the country. The diamond-fields meant men and money to the Cape. These came from Europe. The Dutch Afrikaner chafed at this invasion, which he was powerless to stop—and by which he was soon to profit. The mines gave the agriculturist not only markets but railways far sooner than otherwise they would have come; the mining industry relieved the farmer of taxation which otherwise he would have had to bear. Nevertheless the new-comers (by no means free of undesirables) were stamped as *Uitlanders* (foreigners) or *verdoemde rooiverts* ('damned rednecks,' from their ruddy complexions), and new elements of dispeace were let loose in South Africa. Unite or fight was soon the fateful choice before the four states. Lord Carnarvon's federation scheme in 1875 proved premature, like that of Sir George Grey in 1858. Only after the ordeal of two wars was Union to be achieved. The Boer war of 1880–81 ended in the recognition of the independence which had been taken away from the Transvaal (q.v.) in 1877. The Afrikaner Bond, a political organisation formed in the Cape in 1881, constituted a pan-Boer focus and fostered the racial antagonism which, accentuated by the Jameson Raid in 1895–96, again convulsed South Africa in the war of 1899–1902. Some Cape colonials sided actively with the republics, the Colony was invaded in the north, and the sieges of Kimberley and Mafeking ranked among the most memorable events of the war.

But differences were not confined to those between black and white, Boer and Briton. When the governor was not at loggerheads with Downing Street he was often at variance with the Cape colonials. South Africa was the 'grave of reputations' for civilian administrators and soldiers alike. Cape Town discovered that, if its citizens combined, it could at times overrule the governor and even defy Downing Street. Thus John Fairbairn and Thomas Pringle, the poet, secured the freedom of the press despite the efforts of Lord Charles Somerset (governor, 1814–26) to suppress it. Thus, too, the colonists, by agitation and passive resistance (1848–49), defeated the British government's attempt to make the Cape a penal settlement. Among notable governors who followed Sir Charles Somerset were Sir Harry Smith (1847–52), Sir George Grey (1854–61), Sir Bartle Frere (1877–80), Sir Hercules Robinson (1881–89; again as Lord Rosmead, 1895–97), Sir Alfred Milner (1897–1901), and Sir Walter

Hely-Hutchinson (1901-9). The Cape governor also held the office of High Commissioner for South Africa (created 1878) till 1900.

Natal formed part of the Cape Colony 1844-56, as did Basutoland from 1871 to 1883. Permanent annexations which added greatly to the Colony were British Kaffraria (1865: a British province since 1847), Transkei and Griqualand East (1879), Griqualand West (1880), Tembuland (1885), Pondoland (1894), and British Bechuanaland (1895). In 1834 the first step towards self-government was granted by the institution of a legislative council including nominated colonists, to work with the governor and a small executive council (Council of Advice). Twenty years later representative government was conceded; two elected houses were set up—a Legislative Council and a House of Assembly, but the executive council was nominated in London as before. Responsible government was not introduced till 1872, Sir John Molteno being the first prime-minister (1872-78). Eleven more ministries filled the period till Union in 1910, including those of Sir Gordon Sprigg (1878-81; 1886-90; 1896-98; 1900-4), Cecil Rhodes (1890-93; 1893-96), W. P. Schreiner (1898-1900), Dr Jameson (1904-8), and John X. Merriman (1908-10). While eschewing ministerial rank, J. H. Hofmeyr ('Onze Jan') dominated the Afrikaner Bond till his death in 1909. 'Dr Jim' was leader of the (English-speaking) Progressive or Unionist Party; the veteran Mr Merriman, who had been a member of the first Cape cabinet as he was of the last, led the South African Party (mainly Dutch). It was only fitting that the movement which ended in the Union of South Africa (1910) and the combining of the Unionists with the South African Party under General Smuts (1920) should have been initiated by the mother colony of the sub-continent, when, in 1907, the Cape parliament passed a resolution advocating closer union.

For Cape history, see works by Leibbrandt, Theal (1907-20), and Cory (1910 *et seq.*); for commerce, resources, &c., Playne's *Cape Colony* (1911); for the diamond-fields, volumes by Gardner Williams (1903), P. A. Wagner (1914); for the Transkeian Territories, a book by C. C. Henkel (1903); for natives, S. M. Molema's *The Bantu Past and Present* (1920), Dudley Kidd's *Essential Kaffir*, and the South African Native Races Committee reports (1901, 1908); also Lady Anne Barnard's *South Africa a Century Ago* (1901), and Olive Schreiner's *Story of an African Farm* (1883). Further relevant information will be found in this work in the articles AFRICA, BASUTOS, BECHUANALAND, BOERS, CAPE TOWN, DIAMOND, GRIQUALAND, JAMESON (SIR L. S.), KAFFIRS, KIMBERLEY, NATAL, ORANGE FREE STATE, OSTRICH, RHODES (CECIL), SOUTH AFRICA, TRANSVAAL, WALVIS BAY.

Capercaillie, or CAPERCAILLIE, also called Wood-grouse, or Cock of the Woods (*Tetrao urogallus*), the largest of the game birds of Europe, is a species of Grouse (q.v.), almost equal in size to the turkey; the male, which is about a third larger than the female, sometimes weighing fifteen pounds or more. In figure and appearance it much resembles the blackcock, but the male has a rounded, not forked, tail, and elongated head-feathers. The general colour of the adult male is brownish-black, minutely freckled with grayish-white and with lighter brown; the quill-feathers dark brown; the tail-feathers nearly black, some of the longer tail-coverts on the sides of the tail tipped with white; the chest is of a shining dark green; there is a small scarlet patch of naked skin above the eye, and the bill is whitish. The general colour of the female and of young males is dark brown, freckled with yellowish-brown; the front of the neck and the chest are yellowish-chestnut; and the feathers of the under parts are generally edged with white. The feet are feathered to the toes, but these are naked. It is an inhabitant

of pine-woods; feeds on berries, seeds, worms, insects, &c., and on the young shoots of the Scots pine, which it greatly prefers to the spruce; occasionally also eating, at least in winter, the buds of the birch and other trees. The females and young feed largely on insects and worms. The female makes her nest on the ground, and lays from six to twelve eggs, of a pale-reddish or yellowish brown, spotted with other shades of brown, and more than two inches long. The young birds keep by the mother till winter. Like the blackcock, the capercaillie is polygamous. In



Capercaillie.

spring the males indulge in untiring love-song, and in grotesque play to attract the females. Fights between rival males are of common occurrence. The geographical distribution is very extensive: it is found on the pine-covered mountains of all parts of Europe, from Spain and Italy almost to the North Cape, and is abundant in the northern parts of Asia. It was at one time found both in Scotland and Ireland, but was completely extirpated about the end of the 18th or beginning of the 19th century. Through the exertions, however, of the Earl of Fife and other proprietors of great Highland estates, but particularly of the Marquis of Breadalbane, it was restored to the forests of the Highlands of Scotland. It is very capable of domestication, and breeds readily if allowed the range of a space containing pine-trees. It is much esteemed for the table, and is imported from Sweden. See Brown's *Capercaillie in Scotland* (1879), and J. G. Millais, *British Game Birds* (1909).

Cape River, or RÍO DE SEGOVIA, or COCO (properly *Vauvks* or *Wana*), a river of Nicaragua, follows a generally north-east course of nearly 300 miles to the Caribbean Sea, forming part of the boundary between Honduras and Nicaragua.

Capernaüm, was in the time of Christ a prosperous city of Palestine. Though called 'his own city,' it was one of the three which he upbraided 'because they repented not.' The site of the place is in dispute. It has been given as Khan Minia beside the spring Et Tineh, on the north-east corner of the plain of Gennesareth. The site generally accepted, however, by pilgrims and travellers from the 4th century onwards is at Tell Hum or Telhum, a ruined village with traces of a great synagogue, on the north-western coast of the Sea of Galilee. The name Tell Hum or Telhum is held to be a common linguistic corruption of Tankhum. A village of that name (Kaphir Tankhum) was closely identified with Kaphir Nakhum, the traditional tomb of the prophet Nahum. Hence the connection between Tell Hum and Capernaüm, or 'village of Nahum.'

Capers are the pickled flower-buds of the caper-

bush (*Capparis spinosa*). They have an agreeable pungency of taste, with a slight bitterness, and have long been in very general use as a condiment and ingredient of sauces, along with boiled mutton, &c. They are of a grayish-green colour, to improve which copper is sometimes used; this, however, as in the case of other pickles (see ADULTERATION), renders them poisonous.—The Caper-bush is a native of the Mediterranean countries, and is cultivated in some parts of the south of France and in Italy, but most of all in Sicily. It succeeds in the open air even at Paris, but in Britain requires the aid of artificial heat. It is a trailing, rambling shrub, loving dry places, and often growing on rocks or walls. It begins to flower early in summer, and continues flowering till winter. The buds are gathered every morning, and are immediately put into vinegar and salt; at the end of the season they are sorted according to their size and colour (the greenest and least expanded being the best). The fruit is also pickled in the south of Italy, and in other countries both the buds and fruits of different species are used in the same way. Various substitutes for capers are sometimes used, as the flower-buds and unripe fruits of the Indian Cress (*Tropaeolum majus*), those of the Bean Caper (*Zygophyllum Fabago*), and it is said even the buds of the Marsh Marigold (*Caltha palustris*).—The Cape Tree (*Capparis Jamicensis*), of the West Indies, South America, and Florida, is a small tree with a very hard wood.

Capet, HUGO, founded the third Frankish dynasty in 987. The name has been derived from *cappa*, the 'monk's hood,' which he wore as lay abbot of St Martin de Tours. Soon after the rise of the Capetian dynasty Paris became its capital. With the House of Capet the history of France may be said really to begin; and it ruled France till 1328. See FRANCE.

Cape Town, mother city of South Africa, capital of the Cape Province, seat of the legislature of the Union of South Africa, is situated between the north base of Table Mountain and Table Bay, in 33° 56' S. lat., 18° 29' E. long. The view of the city from the bay, with the steep and massive mountain close behind it, is most imposing. No less striking is the prospect of Table Bay and Cape Town from the mountain, villas and gardens and vineyards straggling up towards the pine and oak and silver tree plantations which clothe the lower slopes. The Table proper (3582 feet; 2 miles long) often has its top covered by the south-east wind (the 'Cape Doctor') with a rolling mass of white cloud—the 'table-cloth'; it is joined by the Saddle to Devil's Peak (3300 feet) on the NE., and by Kloof Nek to Lion's Head (2100 feet) on the NW.

For long after the landing of Van Riebeeck in 1652, the history of Cape Town (*Kaapstad*) and that of the Cape Colony were identical (see CAPE OF GOOD HOPE). The town was laid out by its Dutch founders with mathematical preciseness, the main streets intersecting at right angles. The houses of old Cape Town are mostly flat-roofed, oblong, and whitewashed. Church towers and mosque minarets rise here and there, in this motley metropolis, with an occasional factory chimney to show the encroachment of industry. In the heart of the city lie the rich and beautiful Municipal Gardens. Alongside these runs, for three-quarters of a mile, a fine old oak avenue. On its western side is Government House, a heavy, irregular building, commenced c. 1740. The Houses of Parliament (opened in 1885; extended in 1910 for the Union legislature), the South African Public Library (founded in 1818), St George's Cathedral and Grammar School, the Supreme Courts, and the doyen Dutch Reformed Church (with an early

18th-century clock tower) are clustered about the entrance to Government Avenue; near its top end are the South African Museum and Art Gallery, and the South African College (1829), merged in the university of Cape Town in 1918. Adderley Street—the old Heerengracht—Cape Town's chief thoroughfare, prolongs the line of the Avenue to the shores of Table Bay, and ends in a pleasure-pier. Outstanding edifices in Adderley Street are the Railway Terminus, the General Post Office (where the wild-flower sellers display their lovely wares), and the Standard Bank. Elsewhere notable buildings include the City Hall, opened in 1905; the Old Town House (1755), now holding the Michaelis Art Collection; the quaint old Koopman De Wet house, to-day a museum of Cape furniture, &c.; the Opera House; and the Royal Cape Observatory, instituted in 1820. From Adderley Pier an esplanade stretches southwards on reclaimed ground towards the Castle, which, erected in 1666-80, is the oldest building in South Africa of European construction, and is still intact with its ravelins, glacis, ditches, sally-port, &c.

The earliest conception of the Dutch in settling at the Cape was to make it a place of call for passing vessels. Despite the Suez Canal route, Cape Town, besides being the 'Gateway of South Africa,' is still a 'Tavern of the Seas,' a half-way house on the road to India and Australia. The docks were opened in 1870, the graving-dock in 1882; the breakwater is 3640 feet in length. The dock property covers over 240 acres, and much of the work was done by convict labour. Table Bay Harbour is owned and managed by the Union government. Principal port of the Union, Cape Town handles well over half the country's exports and more than a quarter of its imports.

The population of Cape Town, when it finally became British in 1806, totalled some 6000 or 7000 Europeans and about 11,000 Asiatics and blacks. Since 1867 the city has been governed by a mayor and town council. In 1913 the adjoining municipalities of the Cape Peninsula (Wynberg and Simonstown excluded) were amalgamated with Cape Town, which, embracing Green Point and Sea Point, Woodstock, Maitland, Mowbray, Rondebosch, Claremont, Muizenberg and Kalk Bay, thus extends across the Cape Flats to False Bay, and covers some 60 square miles. In 1921 the population was 183,000, whereof 102,000 were white. The coloured population comprises chiefly Malays, Indians, and those of mixed race. A residential and commercial rather than a manufacturing city, Cape Town's local industries include fruit-growing, viticulture, wine-making, brewing, fishing, whaling, printing and publishing, leather, tobacco, and tea preparation, milling, &c. The environs are exceptionally charming. On one side are the seaside suburbs of Sea Point and Camps Bay, on the other the up-to-date bathing-resort, Muizenberg; between lie a succession of sylvan homes and lovely villages nesting among trees, all connected by electric tram and railway; and behind ever towers Table Mountain with its glorious crags and woods. Rhodes's historic house at Groote Schuur, Rondebosch, is by his prophetic legacy the official residence of the prime-minister of the Union. Portions of the estate are given over to the superb National Botanical Gardens (about 400 acres at Kirstenbosch, established 1913) and as a site for the university of Cape Town.

Cape Verde, the most westerly headland in Africa, jutting out into the Atlantic Ocean, between the rivers Gambia and Senegal, in 14° 41' N. lat., 17° 30' W. long. It was discovered by the Portuguese in 1443, and is said to have derived its name from a group of gigantic baobab-trees adorning its summit.

Cape Verde Islands (*Ilhas do Cabo Verde*), a group of Portuguese islands, lying in 14° 45'–17° 30' N. lat., and 22° 30'–25° 10' W. long., and distant 350 miles west of the cape from which they take their name. They comprise ten inhabited islands (Leeward group: Santiago, Fogo, Mayo, Brava; Windward group: St Antonio, Boa Vista, St Nicholas, Sal, St Vincent, St Lucia), besides several rocky islets. Total area, 1486 sq. m.; pop. (1834) 55,833; (1914) 144,000. The islands are all very mountainous, and owe their origin to the action of submarine volcanoes. The highest elevation is reached in a volcanic peak, 9157 feet above the sea, on the island of Fogo, which was active so recently as 1847. The climate is unhealthy during the rainy season (August to October), fever and dysentery being the chief scourges; and long droughts have sometimes given rise to great famines, as in 1730–33 and 1831–33, which latter cost 30,500 lives. Though water is deficient, vegetation is luxuriant, yielding African and southern European products. The chief exports are purgueira-seeds and coffee. Sugar, manioc, yams, maize, tobacco, and indigo are also grown; the woods have of late years begun to increase; and cattle-breeding is an important industry. Turtles are abundant in the surrounding seas; amber and archil are found on the coasts; and much salt, though not so much as formerly, is procured from the lagoons on the shores, especially on the island of Sal. The inhabitants, who are mostly negroes and mulattoes, indolent but harmless, speak a bastard Portuguese. They are all Catholics. The islands are a colony under a governor-general. Porto Grande, on the island of St Vincent, is a coaling station. The capital is Praya (pop. 5000), in Santiago. The islands were discovered in 1441–56 by the Portuguese, who shortly after colonised them. Slavery was gradually abolished between 1854 and 1878. See Darwin's *Volcanic Islands* (1844), Ellis's *West African Islands* (1885), and Vasconcello's *As Colonias Portuguezas* (1903).

Cape Wrath, a pyramidal promontory of granite gneiss of unrivalled wildness and grandeur, forming the north-west extremity of Scotland and of Sutherland, 69 miles NW. of Lairg. It is 523 feet high, and on it is a lighthouse, built in 1828, and seen 27 miles off.

Capgrave, JOHN, chronicler and theologian, was born at Lynn in 1393. He studied some time at a university, most probably Cambridge, and was ordained priest about 1418. He early entered the order of Augustine Friars at Lynn, and he ultimately became provincial of his order in England; at Lynn he died in 1464. Capgrave was an industrious writer. His works include, in Latin, commentaries on many of the books of the Bible, sermons, various edifying and expository treatises; *Nova legenda Angliæ* (printed by Wynkyn de Worde in 1516), *De illustribus Henricis*, giving the lives of six emperors of Germany, six kings of England, and twelve famous men, all of the name of Henry; and *Vita Humfredi Ducis Glocestriæ*, a life of his patron, Humphrey, Duke of Gloucester. Among his English works are a metrical Life of St Katherine (ed. by Horstmann, 1893); *A Chronicle of England from the Creation to A.D. 1417*; and *Ye Solace of Pilgrimes* (ed. by C. A. Mills, 1911). The *Chronicle* and the *De illustribus Henricis* were edited by Hingeston for the 'Rolls Series' in 1858.

Capias, in common law, a writ directed against the person, so called from the Latin commencement of the process, has various applications, the principal of which are the following:

CAPIAS AD RESPONDENDUM is a writ still used sometimes, instead of a justice's warrant, for the arrest of one against whom an indictment for mis-

demeanour has been found. Formerly, when bail was given in civil actions, it was the writ by which most common-law actions were commenced. Now, under the Debtors Act, 1869, the writ can be used and bail obtained only where the defendant is about to leave the country and his evidence is essential.

CAPIAS AD SATISFACIENDUM, or **CA. SA.** This is one of the writs by which a plaintiff can put a judgment recovered by him in execution. The object of it is to imprison the debtor till satisfaction, but it is rarely used since the abolition of imprisonment for debt. One of the returns to this writ is the famous *non est inventus*. See on the subject of Capias generally, **ARREST**, **ATTACHMENT**, **EXECUTION**, and **BAIL**.

Capillaire, a medicinal syrup, used as a pectoral in chronic catarrhs, formerly prepared by adding sugar and orange-flower water to an infusion of the maidenhair fern, now more generally applied to any flavoured syrup.

Capillaries. The tubes which convey the blood from the heart to the various parts of the

body are termed arteries, while those which return it to the heart, after it has discharged its various functions in the body, are known as veins. The name of capillary (from *capillus*, 'a hair') is given to the minute vessels which form the connection between the terminal branches of the arteries and the commencements of the trunks of the veins. These little vessels are of various sizes, some admitting only one blood-corpuscle at once, while others are large enough to allow of the simultaneous passage of two, three, or more corpuscles. In the muscular tissue their average diameter is 0.003 of a line; they are smallest in the brain, and largest in bone. Their arrangement varies in different parts. In the accompanying figure, which represents their distribution in muscular tissue, they run for the most part parallel to one another; in other cases (as around fat-cells) they have a spherical arrangement, and in the skin and in parts of the intestines they form loops; and many other forms of distribution might be mentioned. These various arrangements have been discovered by the microscopic examination of tissues that have been successfully injected with coloured fluids.



Capillaries:
a, the artery; b, the vein;
c, the intervening capillaries.

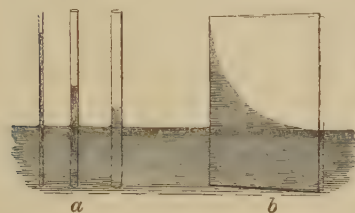
The circulation of the blood through the capillaries may be readily seen in the web between the toes of the hind-foot of the frog, in the tongue of that animal, in the tail or gills of the tadpole, in the wing of the bat, &c. The wall of a capillary is formed of a single layer of flattened cells, attached to each other by their margins (which may be rendered apparent by nitrate of silver), and continuous with the corresponding layer lining Arteries and Veins (q.v.).

The principal uses of the capillary system of vessels will be noticed in the articles on **DIGESTION**, **NUTRITION**, **RESPIRATION**, and **SECRETION**.

Capillarity. When a number of clean glass tubes of very fine bore, each open at both ends, are immersed in water, or in any other liquid capable of wetting them, the water rises in each to a higher level than that at which it stands outside,

and the finer the bore the greater is the height of the water. Moreover, the surface of the water is always concave outwards. The accompanying diagram (a) shows the phenomenon in question.

When similar tubes are immersed in mercury the results are just the opposite of the above. The



mercury now stands at a lower level inside than outside each tube, and the mercury-surface is always concave downwards. The diagram, if

turned upside down, will correspond to this effect. In both cases it is to be observed that the curvature of the surface of the fluid is greater the finer the bore of the tube.

These are the fundamental facts which constitute the phenomena of capillary action, the tubes, with their fine hair-like bores, being called *capillary tubes*, from *capillus*, 'a hair.' The phenomena of capillarity may, however, be produced without the use of capillary tubes. Thus, if two plates of clean glass be set vertically and parallel to one another in a dish of water, the liquid will rise up between them, but the rise is only half of that which would occur in a capillary tube whose diameter is equal to the distance between the plates. As in the case of capillary tubes, the height of the water increases as the distance between the plates diminishes, and the water-surface is concave outwards. If mercury be used in place of water, the mercury will be depressed, and its surface will be convex.

If the plates have two vertical edges in contact, while the opposite edges are kept separate by a thin wedge, the water will rise between the plates to different heights, the height at any point being inversely as the distance between the plates at that point. The intersection of the water-surface with the plate thus forms a curve which is known as the equilateral hyperbola. The diagram (b) shows the phenomenon in question.

In order to understand the cause of capillary action it is necessary to refer to what is known as the surface-tension of fluids. The particles of a body of moderate dimensions are kept together by powerful molecular forces which have one main characteristic, that they are only sensible at insensible distances. From this it is at once evident that there must be an essential difference in state between parts of a liquid close to its surface and others in the interior of its mass. The result of this difference is that every liquid may be regarded as bounded by a surface-film which behaves like a stretched membrane. The tension of this film is what is termed the surface-tension of the fluid. Now, when a soap-bubble is blown at the mouth of a funnel, and the neck is left open, the bubble shrinks and expels the contained air. The air within the bubble is thus proved to be at a pressure greater than that of the atmosphere, otherwise it would not rush out; and it can be proved by mathematical methods that the effect of the surface-tension of the soap film is to make the pressure per unit of surface on the concave side exceed that on the convex side by the expression $2T \left(\frac{1}{R_1} + \frac{1}{R_2} \right)$, where T is the intensity of the surface-tension, and R_1 , R_2 , are the radii of curvature of any two sections normal to the surface and to each other.

We are now in a position to explain the fundamental capillary phenomena. The water-surface is concave outwards, and therefore the water im-

mediately under the surface-film has a less pressure than that of the atmosphere to which its concave side is exposed; and thus by the ordinary hydrostatic law it belongs to a higher level than the undisturbed water, the pressure on which is equal to that of the atmosphere. In the case of mercury, on the other hand, we see that, since the fluid surface is convex outwards, the mercury immediately under the surface-film must have a greater pressure than that of the atmosphere, and must therefore stand at a lower level than the undisturbed mercury.

It can be shown mathematically that the height of elevation of water, or depression of mercury, varies inversely as the radius of the tube. This agrees with the experimental fact that the finer the bore the greater is the capillary action, and is also a direct consequence of what has been stated above. The finer the bore, the greater is the curvature of the surface, and therefore the greater is the difference between the pressure on the concave and that on the convex side of the film. Thus we account for the increased height of elevation of water and depression of mercury.

We have now to explain why the water-surface is concave and the mercury-surface convex.

When two fluids, such as water and air, are in contact, we have seen that the surface of separation is in a state of tension. Now, when a solid is in contact with two fluids, as in the case of water in a capillary tube, there is a different tension in each of the three surfaces separating a pair of media. Further, since the solid cannot alter its form, the angle at which the surface of contact of the two fluids meets the surface of the solid, called the *angle of capillarity*, must depend on the value of the three surface-tensions. When the two fluids are air and water, or air and mercury, the tension of the surface separating the two fluids exceeds the difference between the tensions of the surfaces separating the solid from each of the fluids; and thus the angle of capillarity will be acute or obtuse, according as the one or the other of the latter tensions exceeds the other.

The effect of heat on capillary action may be noted in passing. When heat is applied, it is found that the tension and curvature of a water-surface are diminished, and thus, on both accounts, the height to which water rises, or the depth to which mercury is depressed, in a capillary tube, becomes less as the temperature rises.

The depression of mercury in a fine glass tube makes it necessary to use a correction in reading off the height of the mercurial column in the barometer, which, owing to it, stands always a little lower than the height due to the atmospheric pressure.

There are many phenomena which can easily be explained by the help of capillary action. Thus, when two light bodies, such as two pieces of cork, are left to float on still water, near each other, they soon come together, moving at last with a rush. The water wets the floating bodies and rises round them, and thus, when they are near each other, the space between them becomes like part of the interior of a capillary tube; and, the pressure between the bodies being less than that outside, the bodies are driven together, and therefore seem to attract one another. This is always the case with any two bodies each of which is wetted by the water, and it is also true when neither is wetted. If one of the bodies is smeared with oil to prevent the water from wetting it, the two will behave as if they repelled one another. Again, when a drop of water is placed between two very true plates of glass, the pressure produced by the capillary action forces the plates together, thus increasing itself not only by the enlargement of the wetted surfaces, but by increasing the curvature round the edges. The pressure produced in this way may be sufficiently

great to crack the plates. The action of a boy's 'sucker' is explainable in a similar manner.

Capistrano, GIOVANNI DA, born 24th June 1386, at the little town of Capistrano, in the Abruzzi, entered the Franciscan order at the age of thirty, and there distinguished himself by his eloquence and devotion. From 1426 he was employed as legate by several popes, and acted as inquisitor against the Fraticelli (q.v.). In 1450 he preached a crusade in Germany against Turks and heretics, appealing to the masses, not the nobles, and successfully opposed the Hussites in Moravia, although from Bohemia he was expelled by George Podiebrad; his fanaticism led to many cruel actions, such as the racking and burning of forty Jews in Breslau, on a charge of profaning the Host. When Belgrade was besieged by Mohammed II. in 1456, he led a rabble of 60,000 to its relief; but his enthusiasm was greater than his strength, and he died at Illock, on the Danube, 23d October 1456. He was canonised in 1690.

Capita, DISTRIBUTION PER, is a familiar expression in the law relating to wills and succession. It means that where the persons claiming under a will consist of, e.g. three families of grandchildren, the estate or fund is divided equally among all the grandchildren (whatever the size of the family), and not equally among the three families. The opposite principle of division, viz. among families, is called distribution *per stirpes*. It is surprising how frequently testators fail to make their meaning clear on this simple point.

Capital. See COLUMN.

Capital, in the ordinary sense, is the means with which business is carried on, and may consist either of money or of property convertible into money. In the more accurate language of political economy, capital is wealth appropriated to reproductive employment. It is wealth used for producing more wealth. That which distinguishes capital from other forms of wealth is the purpose to which it is applied. A painting, so long as it adorns the room of a private gentleman, cannot be regarded as capital; in the hands of a dealer, who sells it in order to make a profit, it becomes a form of capital. Capital is one of the three requisites of production, the other two being land and labour. Capital is usually divided into two classes—*circulating* capital, which consists of the wages paid to the workmen, and of the raw material used up in the processes of industry, &c.; and *fixed* capital, consisting of buildings, machines, tools, railways, telegraphs, canals, shipping, &c. Circulating capital is being continually used up, and disappears in the using, while fixed capital may last for a long time, and may be used over and over again. Railway lines, canals, and docks, may last for generations, and with the necessary repairs, renewals, and improvements, continue as effective as ever. It should be remembered, however, that such distinctions are only generally valid, and that a very definite line between fixed and circulating capital cannot be drawn. Thus with regard to railways, while the stations and permanent way are undoubtedly fixed capital, we may justly hesitate as to the engines and wagons, which only last a few years.

With reference to fixed capital, it should also in general be said that its permanence is only one of degree. Machinery, tools, and shipping, have only a limited duration, as they either become worn out, or, as more frequently happens, are superseded by more effective appliances. Docks, canals, bridges, and great works for the reclaiming of agricultural land, are more adapted for permanence. But though considerable, they are only a limited part of the capital of a country. The vast

proportion of capital needs from time to time to be replaced.

Capital is the result of the industry of past generations used to promote and facilitate the industry of the present and future. In every form of capital we can trace the labour, ingenuity, and foresight of the men who have lived before us. The history of capital is a process of development, of invention, adaptation, and accumulation, which is observable in different degrees at different epochs of the world, but during the last hundred and fifty years has been vastly more active than at any former period. It is usual to say that capital is the result of saving or abstinence, but such a formula gives a very misleading conception of the motives which have led to the growth of capital. The growth of capital is a mixed process, the real motives of which can be truly and adequately understood only by a study of the historical facts. No doubt there has been abstinence, but there have been many other moral qualities displayed in the process. For the development of capital it is of course necessary that production should exceed consumption, leaving a sufficient margin for future increase. In the modern development of capital the energy and inventiveness with which natural resources have been utilised for the production of wealth have been unexampled, resulting in the formation of new forms of capital, and in a gigantic accumulation of it absolutely unparalleled. The productive power of capital is indeed practically unlimited. This enormous development of capital has offered new problems to the economist, or at least presented the old questions in a new light.

The history of capital is a process of evolution which can be rightly understood only in its connection with the general history of society. It must specially be studied in connection with the other requisites of production, land and labour.

CAPITALISM, in social and economic discussion, means the rule of the capitalists or owners of capital. These are the controlling power in the present industrial system, and have taken the place formerly held by the landed aristocracy as the pivot of the social and political order. See **SOCIALISM**.

Capital Account. Such is the name given to what concerns the capital stock of a railway or other public company. In authorising a railway company, parliament or congress gives power to raise so much money by shares, and so much by borrowing. This money forms the capital of the company; and constitutes the *Capital Account*. On this fund the directors of the company make drafts to pay for the land, and all the works connected with the line, as also rails, locomotives, carriages, and, in short, everything involved in perfecting the railway up to the point of working. After the railway is opened, all working expenses and renewals of line and plant should be charged to Revenue Account, but extensions of the line and additional plant should be charged to Capital Account. The same principle applies to all joint-stock companies. It is of the utmost importance that these two accounts be kept quite distinct, and that nothing be charged to capital which ought to be defrayed by revenue. It is by neglecting this precaution that an appearance of fallacious prosperity has often been produced, which has ultimately ended in ruin.

Capital Punishment in criminal jurisprudence is the punishment of death (Lat. *capitis pena*). This extreme penalty, notwithstanding the practice of the world from the remotest times down to the present day, has frequently been reprobated by philosophers and philanthropists, who have even gone so far as to deny the right so to punish to any earthly power. Thus many

hold strongly that, while higher animals may destroy the lower, man being the highest created existence on earth can be lawfully deprived of life by God alone. They argue that the voluntary destruction of human life by man is in all circumstances a violation of moral law—an argument which seems to involve the absolute prohibition not only of capital punishment, but of war. The weight of opinion, however, among the most generally accepted authorities appears to be in favour of capital punishment, on the ground that the execution of malefactors is, in certain circumstances, necessary for the protection of society against the repetition of certain forms of crime. The Marquis Beccaria and others, however, strongly argued against the capital sentence being carried out in any case, denying the right, in fact, of government so to punish, and maintaining, besides, that it is a less efficacious method of deterring others than the continued example of a living culprit condemned, by labouring as a slave, to repair the injury he has done to society. Bentham, on the contrary, holds that death is regarded by most men as the greatest of all evils; and that especially among those who are attached to life by the ties of reputation, affection, enjoyment, hope, or fear, it appears to be a more efficacious deterrent than any other. On the question of right, Beccaria is still more pointedly refuted by Sir Samuel Romilly, who did so much to mitigate the severity of the criminal law: 'Beccaria and his disciples confess that it is not the greatest of evils, and recommend other punishments as being more severe and effectual, forgetting, undoubtedly, that if human tribunals have a right to inflict a severer punishment than death, they must have a right to inflict death itself.'

In all discussions on this subject it is necessary to bear constantly in mind the principles of punishment in general. These have been a fruitful subject of controversy for many centuries, but the general rule can hardly be better stated than in the words of Plato (*Gorgias*, § 525): 'Every one who undergoes punishment, if that punishment be rightly inflicted, ought either to be made better thereby, and profit by it, or serve as an example to the rest of mankind, that others, seeing the sufferings he endures, may be brought by fear to amendment of life.' And again (*Protagoras*, § 324) he says: 'No one, when punishing a criminal, directs his thought to the fact, or punishes him for the fact of his having committed a crime; but he who wishes to inflict rational punishment acts with regard to the future, that the man who is punished, and all who see him punished, may be deterred from doing wrong again.' On this principle, capital punishment for murder is justified only in so far as it tends to prevent murder; and if there be a mode in which the murderer's life can be spared without sacrificing other lives, then capital punishment is inadmissible. Thus we are driven back on the teaching of experience. The question can be answered only relatively, and statistics seem to show that the same answer will not be always and everywhere the true one. In some states of society—especially in half-settled or semi-civilised communities—criminal statistics afford strong confirmation of the theory which maintains the superior efficacy of capital punishment as a deterrent. On the other hand, the experience of many states in Europe, where the death penalty has been abolished, is difficult to reconcile with the view that the maintenance of the extreme penalty affords the best security for human life.

While the primary ends of punishment are to prevent the repetition of the crime by the wrong-doer, and to deter others by making the wrong-doer a warning, it is necessary to keep in mind that the administration of criminal justice owes

a great part of its strength and effectiveness to the instinct of retribution and the demand for vengeance. The conception of punishment or retribution, or, in other words, the principle that as a man deals with others so should he himself be dealt with, is fundamental in the early history of criminal law (see CRIMINAL LAW). 'Thine eye shall not pity; but life shall go for life, eye for eye, tooth for tooth, hand for hand, foot for foot' (Deut. xix. 21). This conception of penal justice still holds a firm place in popular thought, and it has been maintained by distinguished lawyers and philosophers. Thus it finds terse expression in the statement of Lord Justice Fry: 'The object of punishment is to adjust the suffering to the sin.' Similarly Kant holds that punishment cannot rightly be inflicted for the sake of any benefit to be derived from it either by the criminal himself or by society, and finds the sole and sufficient justification of it in the principle that an evil-doer should make satisfaction for the wrong he has done by suffering according to his deserts.

In recent years there has grown up a sentiment of compassion for the criminal. The sense of the reality of guilt is less strong. There is a tendency to consider the criminal as a victim of circumstances, and to have regard to the moral and mental condition of the wrong-doer rather than to the quality of his act. Such sentiments, if they become excessive, are a source of danger in the administration of criminal justice. If a penalty appointed by criminal law is out of harmony with public opinion, or is generally regarded as unduly severe, the consequence is that juries, influenced by considerations springing from the nature of the penalty, refuse to convict. In this way the penalty comes to lack certainty—a feature without which no punishment can be effectual as a deterrent. That some influence similar to this is at work in recent years in Great Britain may fairly be inferred from the official statistics, which show that the proportion of convictions in charges of murder is much less than in charges of non-capital crimes.

Death was in former times in England the ordinary punishment for all felonies. It would be possible to extend almost indefinitely the list of offences for which men could be legally hanged at the commencement of the 19th century. It must, however, be remembered that the practice of the law had for many years been much less severe than the theory. Thus, while there were more than 200 offences in the statute-book for which capital punishment might be inflicted, there were only twenty-five offences for which any one had suffered death during the preceding three-quarters of a century. To the exertions of Sir Samuel Romilly we are mainly indebted for the reformation of our criminal code, and the removal from the statute-book of the obsolete relics of a barbarous age. From 1808 to his death in 1818 Romilly, undaunted by many discouraging failures, strenuously continued his humane efforts to destroy this cruel system. Later the cause of criminal reform found in Sir James Mackintosh a bolder and abler, if not more earnest, champion, and under his praiseworthy exertions, aided by the wise counsels of Peel, the inhumanity and impolicy of the old criminal code gave way to a course of legislation which has reduced the application of death as a punishment within its present humane limits. In 1823 five statutes exempting from capital punishment about a hundred felonies were passed by both houses without a dissentient voice, and Peel's subsequent efforts in 1826 to consolidate the criminal law were no less successful. The punishment of forgery with death ceased in 1832-37. Since the statute of 1861 there remain in England only four crimes punishable by death—setting fire to H.M. dock-

yards or arsenals; piracy with violence, treason, and murder. Practically it is only in the case of treason and murder that the capital sentence is ever pronounced; and even then it is not always carried out, for the crown may in its absolute discretion exercise the prerogative of mercy. In practice the Home Secretary, if for any reason he thinks the case a fit one for the interposition of the royal mercy, recommends this course to the king—the penalty of penal servitude being usually substituted.

In Scotland the administration of the criminal law has perhaps been, on the whole, as severe as in England. Erskine says that 'those crimes that are in their consequences *most hurtful to society* are punished capitally or by death,' a category that is certainly sufficiently indefinite. But in the more modern practice of Scotland capital sentence was only pronounced in the four pleas of the crown—viz. murder, rape, robbery, and wilful fire-raising, to which may be added housebreaking. By the Criminal Procedure (Scotland) Act of 1887, 50 and 51 Vict. chap. 35, it is enacted that capital sentences shall be abolished except on conviction of murder or of offences against the Act 10 Geo. IV. chap. 38, by which a variety of attempts to murder are made capital. The Children Act, 1908 (8 Edw. VII. chap. 67), enacts that sentence of death shall not be pronounced against a person under sixteen years of age. This enactment extends to England as well as to Scotland.

In the United States, each state has jurisdiction over its own territory, and the laws punishing crime differ in several respects. In many of the states murder is by statute divided into different degrees, differing from each other by the malice and premeditation which accompany the act. Death by hanging is the usual penalty for murder of the first degree, but in a few states imprisonment for life is substituted for capital punishment. In some states, as Michigan, Wisconsin, Rhode Island, and Maine, capital punishment has been done away with. In the states of New York and Iowa, on the other hand, the legislatures, having abolished the death penalty, were compelled by the consequent increase of crime to restore it.

In Holland there have been no executions since 1860, and capital punishment was totally abolished by law in 1870. In Rumania it was abolished in 1864, and Portugal has adopted the same course. In Belgium the punishment of death is practically abolished, for, though the death sentence is formally retained, no execution has taken place in that country since 1863. In Switzerland capital punishment was totally abolished in 1874, but, owing to a marked increase in the number of murders, by a federal decree of 18th June 1879 the cantons recovered the right of re-establishing the punishment of death in their respective territories. In many European countries in which the extreme penalty is still enforced, the law has been practically abrogated by the marked growth of more humanitarian sentiments.

For the various methods of execution, whether hanging as in England and most parts of the United States, beheading by sword or guillotine as in Germany and France, garroting as in Spain, and death by electrocution as in New York, see EXECUTION, and the articles on the several methods. In England, in 1868 (as in Germany since 1877), an act was passed directing that all executions should henceforth take place within the walls of prisons.

In Military Law, owing to the necessity of enforcing strict discipline, capital punishment has always held an important place. The offences to which the death penalty is attached are in Britain regulated by statute. The law on the subject as regards the army is contained in the Army Act,

the Reserve Forces Acts, the Territorial and Reserve Forces Act, 1909, and the Rules of Procedure. The Army Act, which now forms the foundation of the military law of the United Kingdom, is continued annually by act of parliament. Capital punishment may be incurred by various acts of sedition, violence, and gross neglect of duty. Any soldier who deserts His Majesty's service, or leaves without orders any guard or post, or offers violence to his superior officer, being in the execution of his office, or disobeys any lawful command of his superior officer, renders himself liable to the penalty of death, or such other penalty as the court-martial may inflict. Certain other specific offences are punishable by death only when they are committed on active service. In the ordinary case sentence of death can be passed only by a general court-martial, consisting of nine officers, of whom five are not under the rank of captain. On active service, however, a field-general court-martial, consisting of three officers, may award the death penalty. Another safeguard against undue haste and lack of consideration is found in the provision that no sentence of death can be pronounced by a court-martial unless two-thirds of the officers present, in the case of a general court-martial, and all in that of a field-general court-martial, concur therein. No sentence is valid unless it is duly confirmed by an authority independent of the court which pronounced the sentence. It is also provided that a judgment of death may be commuted for penal servitude for any term not less than four years, or for imprisonment for such term as shall seem meet. The system of military laws drawn up for the army is also applicable to a limited extent to the territorial force, especially when called out for service. In the army capital punishment is inflicted by the offender being either shot or hanged. In the United States the concurrence of two-thirds of a general court-martial is also required; and no sentence of death can be carried out until confirmed by the president, save in cases of persons convicted in time of war, as spies, mutineers, deserters, or murderers.

In the British navy, the law on the subject is covered by the Naval Discipline Act, 29 and 30 Vict. chap. 109, amended by a series of later acts which now constitute together the penal code of the navy. Formerly certain offences in the navy, whether on board ship or on shore, were punished with death absolutely, without any discretion in the court to alter or mitigate the sentence. It was under these unnaturally severe Articles of War, passed in the twenty-second year of Geo. II., under the influence of the Duke of Cumberland, that the unfortunate Admiral Byng (q.v.), having been found guilty of neglect of duty in an action against the French, was shot in 1757. On that occasion the court-martial, before passing sentence, sent to the Admiralty in London to know whether they were at liberty to mitigate the sentence, but were informed that they had no such power. The provisions of the present act, however, confine sentence of death, without alternative, to cases of murder or traitorous misconduct in the presence of the enemy. As regards all other offences, the courts-martial are authorised to abstain from pronouncing sentence of death, if they shall think fit, and to impose such other punishment instead, as the nature and degree of the offence may deserve. Further, except in the case of mutiny, the punishment of death, awarded by a court-martial, cannot be inflicted until the sentence has been confirmed by the Admiralty or by the commander-in-chief on a foreign station. In this discretionary sense the death penalty is retained in the navy in the case of a large number of offences, such as acting as a spy for the enemy, mutiny, cowardice, desertion to

the enemy. Judgment of death can only be passed with the concurrence of a two-thirds majority of the court-martial, or if the officers present do not exceed five, with the concurrence of four of them. In the United States all sentences of death must be approved by the president.

See Basil Montagu, *On the Punishment of Death* (1813); *Memoirs of Sir Samuel Romilly* (1840), and his writings; Bentham, *Rationale of Punishments* (1830); Beccaria, *Essay on Crimes and Punishments* (1775; Eng. trans. by Farrer, 1880); Berner, *Die Abschaffung der Todesstrafe* (1861); Mittermaier, *Die Todesstrafe* (1862; Eng. ed. by J. M. Moir); Von Holtzendorff, *Das Verbrechen des Mordes und die Todesstrafe* (1874); Clode's *Administration of Justice under Military Law*; Professor Lorimer, *Institutes of Law*; Oldfield, *The Penalty of Death* (1901); J. M. Moir's *Capital Punishment* (1865); Stephen's *History of the Criminal Law*. See also the publications of the Howard Association, London.

Capitals (*majuscula*), in contradistinction to small letters (*minuscule*), are larger and differently shaped letters employed in writing and printing to help the eye, to relieve the uniformity of the page, to increase the facility of keeping and finding the place, to mark the beginnings of sentences, proper names, &c. Among the ancients, and during the earlier part of the middle ages, no distinction between capitals and small letters was known; in a sense, writing was originally all capitals (UNCIALS, q.v.); and after the practice had been introduced of beginning books and chapters with great letters, often adorned or illuminated with much artistic ability, it was long before capitals were employed in such a way as could afford much real advantage to the reader. Considerable diversity has existed at different times with regard to the employment of them, the books of the 17th and 18th centuries exhibiting a much greater proportion of them than those of the present day. In German books all substantives usually begin with a capital letter. Adjectives formed from proper names, as *English*, *French*, and the like, are generally begun with a capital in English books, but not in French nor in German ones. SMALL CAPITALS are so called as being smaller than the initial capitals. See ALPHABET, WRITING.

Capitation. For Capitation Grants, grants of so much per head, see EDUCATION; for Capitation Tax, see POLL-TAX.

Capito, GAIVS ATEIVS (c. 37 B.C.-22 A.D.), a Roman jurist, founder of the school opposed to Labeo, seems to have gained the favour of Augustus and of Tiberius by his subservience.

Capito, or KÖPFEL, WOLFGANG FABRICIVS, reformer, born in 1478 at Hagenau in Alsace, entered the Benedictine order, and became professor of Theology at Basel, where he showed in his lectures a tendency to shake off the trammels of the scholastic writers. He approved of Luther's action, but nevertheless in 1519 entered the service of Albert of Mainz; and it was not till some years later that he finally declared for the Reformation. He then entered zealously into its work, shared with Bucer the composition of the *Confessio Tetrapolitana*, and took part in the Synod of Bern in 1532. He died in November 1541.

Capitol (Lat. *Capitolium*), the great national temple of ancient Rome, situated on the southern summit of the *Mons Capitolinus*, the smallest but most famous of the seven hills on which Rome was built. The hill is an irregular oblong in figure, about three-quarters of a mile in circumference at its base, running from north-east to south-west, and terminating at its southern extremity within 250 yards of the river in a precipice with an abrupt fall of 80 feet—the 'Tarpeian Rock,' over which state-criminals were thrown. On its northern summit, the higher and steeper of the two, stood

the *Arx* or citadel of Rome, the site of which is now occupied by the church of *S. Maria in Araceli*. Since the whole hill was fortified and regarded as the natural defence of the city, *Arx* is not unfrequently used as if synonymous with *Mons Capitolinus*, and similarly from the importance and reverence attaching to the temple the name *Capitolium* often means the whole hill. The Capitol was founded by Tarquinius Priscus, and completed by Tarquinius Superbus. It was burned down during the civil wars (83 B.C.), was rebuilt by Sulla, was burned again by the soldiers of Vitellius (69 A.D.), rebuilt by Vespasian, but burned a third time in the reign of Titus (80), and splendidly restored by Domitian, whose structure lasted to a late period of the empire. The original ground-plan, however, with that rigid conservatism so characteristic of Roman law and religion, was never altered. The temple comprised three distinct cells (*cellæ*), inclosed by one roof, the middle cell dedicated to Jupiter, those on either side to Juno and Minerva. In the Capitol the Sibylline books were stored, and here the consuls on entering upon office offered up sacrifices and made their vows; hither also the victorious general on his triumph was borne in his triumphal car to give thanks to Jupiter.

The modern Capitol (*Campidoglio*), built on the site, and part of the basement of the ancient Capitol, was designed by Michelangelo, but is one of his inferior works.

On the Capitoline Mount there was also the temple of Jupiter Tonans, built by the Emperor Augustus; and the magnificent *Tabularium* (built by Quintus Catulus, 73 B.C.), containing archives. For the U.S. Capitol, the building in which Congress meets, see WASHINGTON; the state capitols are mentioned in the articles on the state capitals, ALBANY, AUSTIN, &c.

Capitularies (Lat. *capitularia*), the name given to the laws, or royal enactments, issued by the Frankish kings. These laws proceeded from the great assemblies of the king, nobles, and bishops, which formed the estates of the kingdom, as distinguished from the laws issued for the separate states, which were called *leges*. They were divided into general and special *capitularies*, according to the more or less general nature of the interests which they embraced, and the mode of their publication. They have by no means been all preserved. The most famous are those of Charlemagne and of St Louis. The first collection was made in 827. It contained in four books the capitularies of Charlemagne and his son Louis le Débonnaire. They were brought down to 845 by Benedict, deacon of Mainz, and later supplements were added by successive editors, until the number of capitularies reached 2100. These were all included in the great edition of Baluze (2 vols. Paris, 1677).

Capitulation, a treaty consisting of several specified conditions (Lat. *capitula*, 'heads'). In the military sense of the word, a capitulation is a treaty of surrender to an enemy. When a place can no longer be defended, on account of failure of ammunition or provisions, or the progress made by the besieging party, a white flag is commonly hoisted as a sign that the besieged are willing to capitulate. According to the kind and degree of peril in which the fortress is placed, so are the terms which the governor may reasonably look for from his successful opponent. Sometimes the arms and military stores are left to the besieged, but oftener they are taken by the besiegers, except articles of private property belonging to the officers and men. The 'honours of war,' the marching out with drums beating and colours flying, are usually stipulated for, unless the conqueror exacts very

severe terms. The mildest form of a capitulation is a *convention*, agreed to when the conqueror is not strong enough to insist on stringent conditions. The capitulation of Metz (q.v.) on 27th October 1870 was the most notable of recent times.

Capitulation is also the name given to an arrangement by which foreigners receive certain immunities in the state within which they reside, such as the grants made in the 17th century by the Porte to France, and later to other western countries. In like manner foreigners in Egypt and Japan used to be subject to their own consular jurisdictions, and exempted from native judicatories. See CONSUL.

Capo d'Istria, a fortified seaport of Italy (Austria till 1919), situated on a rocky island in the Gulf of Trieste, 9½ miles SSW. of the city of Trieste. Connected with the mainland by a stone causeway, nearly half a mile long, it has a modern cathedral, a Gothic town-hall on the site of a Roman temple, and a trade in pilchards, oil, salt, and wine. Pop. 10,000. In ancient times it was known as *Egida*, and afterwards as *Justinopolis*, in honour of Justin II., who restored it.

Capo d'Istrias, IOANNES ANTONIOS, COUNT, president of the Greek republic from 1828 to 1831, was born 11th February 1776 in Corfu, where a monument was erected to him in 1887. His family had been settled there since 1373, but originally came from the Illyrian town of Capo d'Istria. He devoted himself to political life, and in 1809, after holding a high position in the Ionian Islands, he entered the diplomatic service of Russia. Here his policy tended to the separation of Greece from Turkey. In 1828 he entered on a seven years' presidency of Greece; but imbued as he was with Russian ideas, he aroused discontent by his autocratic measures; and on 9th October 1831 he was assassinated in a church at Nauplia. See his *Life* by Mendelssohn-Bartholdy (Berl. 1864). His feeble brother, Iony Augustinos (1778-1857) succeeded him, but resigned in the following April.

Caponier. See CASEMATE.

Caporetto, a village on the Isonzo, scene of an Italian defeat in 1917. See WAR (GREAT).

Cappadocia, the name of a district of Asia Minor, the signification of which differed widely at different periods in its history. Under the Persian rule it included the whole north-eastern part of Asia Minor from Mount Taurus to the Euxine; but after its division into two satrapies, the central and inland came to be called Cappadocia proper; the other Cappadocia ad Pontum, gradually shortened to Pontus. In the former and stricter sense Cappadocia was bounded by Galatia and Lycaonia on the west, by Cilicia and Syria on the south, by Armenia on the east, and by Pontus on the north. It is a high upland region broken by detached mountains and groups of mountains; its eastern portion is traversed by the Anti-Taurus. The river Halys (Kizil Irmak) crosses the northern part of Cappadocia. Ruled under the Persians by hereditary satraps or tributary kings, Cappadocia was the ally successively of the kings of Macedonia, of Mithridates, and of the Romans, but ultimately (17 A.D.) became a Roman province.

Capparideæ, or CAPPARIDACEÆ, a dicotyledonous order allied to Cruciferae, including about 350 known species, herbaceous plants, shrubs, and trees, mostly natives of tropical and subtropical countries. Many of the species possess stimulant properties. Of this the species of *Capparis* furnish the most familiar example (see CAPERS); but *Cleome pentaphylla* (the mustard-caper) blisters the hand, and some are positively poisonous.

Cappello, BIANCA. See MEDICI.

Caprera, one of a group of small islands called the Buccinari Islands, in the Strait of Bonifacio, to the east of the northern extremity of Sardinia, from which it is separated by a strait less than 2 miles broad. Measuring 6 by 2 miles, and 10½ sq. m. in area, it is rocky, bare, and unfertile, with no streams, and few places adapted either for the pasture of cattle or for the plough. In former times it was the abode only of wild goats—whence its name (Lat. and Ital. *capra*, 'a goat')—and rabbits, and was occasionally visited by goat-herds and fishermen. It was the much-loved home of Garibaldi from 1854 till his death here on 2d June 1882. He was buried behind his house. In 1885 the island was purchased from his heirs by the Italian government.

Capri (the ancient *Capræa*), a charming island in the Mediterranean, at the entrance of the Bay of Naples, 3½ miles from Cape Campanella, and 21 S. of Naples. Only 3½ sq. m. in area, it yet displays a rich variety of beautiful scenery, ruins of antiquity, and points of historical interest, and contains a population of 7000. The island is composed of two mountain masses, separated from each other by a depression like the seat of a saddle. That on the west, called Monte Solaro, has an elevation of 1918, that on the east of 860 feet. On a shelving rock at the base of the eastern mountain stands the town of Capri, with walls, gates, and drawbridges, and a population of 5000. It commands a beautiful prospect, and till 1876 communicated with Anacapri, on the western tableland, by a rock-hewn flight of 536 steps; now, however, there is a carriage-road between the two places. The coast is precipitous, with only two safe landing-places, both near Capri. The island was a celebrated place in the times of Augustus and Tiberius. Ruins are still found of Roman baths and aqueducts, and of the twelve grand villas or palaces built in honour of the twelve chief deities by the Emperor Tiberius (q.v.). The inhabitants now consist of fishermen, sailors, and a few traders, with vine-dressers and cultivators of olives in Anacapri. Wherever a tree can be planted, the hopeful and industrious people have prepared for it a soil by persevering toil in terrace-culture. The wine of Capri, both red and white, is well known in commerce. Delicious quails, which in vast numbers alight on the island during their migrations to and from Africa, in spring and autumn, are taken in nets, and form an important item in the resources of Capri. To the west of the town of Capri is situated the *Grotta Azzurra* (Blue Grotto), a remarkable cavern, entered from the sea by a narrow opening not more than three feet high. Inside, however, it is found to be of magnificent proportions and of marvellous beauty, the gorgeous colouring being said to be produced by the reflection and refraction of the sun's rays through the water. Elliptical in form, it has a length of 118 feet, a breadth of 98 in the widest part, and a height of 40 in the loftiest, with 39 feet of water beneath. See German works by Gregorovius (Eng. trans. 1879) and Allers (1894); and by Alan Walters (1893).

Capriccio, in Music, is a species of free composition, not subject to rule as to form or figure. The earliest application of the term was to pieces in a fugued style, upon a lively subject. Last century capriccios were of the nature of studies, in which one single figure predominates. It is used in the modern form 'caprice,' as equivalent to 'fantasia,' though sometimes deviating little from regular sonata or rondo form, as in Mendelssohn's several examples.

Capricornus, the *Goat*, the tenth sign of the Zodiac (q.v.). For the tropic of Capricorn, see TROPICS.

Capridæ, a term sometimes used to denote the Sheep and Goat family (Ovis and Capra), as distinguished on the one hand from Cattle (Bovina), and on the other from Antelopes (Antelopina). The term Ovis is more frequent.

Caprification, an ancient custom of hanging goat-fig or Caprificus branches on trees which produce edible figs. The wild fig is monoecious, the cultivated practically dioecious, since it is propagated by cuttings which retain the character of the branches from which they were taken. On the goat-fig, derived from branches which bear spring inflorescences, we find, as on those branches of the wild fig, (1) male flowers, and (2) sterile female flowers, which the eggs of an insect (*Blastophaga*) turn into galls. On the edible fig-tree we find normal female flowers which are not adapted to become galls. Their styles and stigmas are quite different from those of the female flowers on the goat-fig. Now, when the parasitic insects become mature and leave the galls of the female flowers on the goat-fig, they bear with them also the pollen from the male flowers of the same tree. They fly to the edible fig-tree, and there fertilise the normal female fig-flowers. The ancient custom is therefore very reasonable. The male and insect-containing female flowers of the wild-fig are hung on the edible fig-tree, that so the pollen of the male flowers may be carried by the liberated parasitic insects to fertilise the normal female flowers, and produce seed-bearing figs. Seedless figs, eaten fresh, require no pollination. See a work by Solms-Laubach (Göttingen, 1882); F. Ludwig, *Biologisches Centralblatt* (1885), p. 564; Ravasini, *Die Feigenbäume Italiens* (1911); also FIG.

Caprifoliaceæ, a natural order of sympetalous dicotyledons, nearly allied to Rubiaceæ, from which they are mainly, though not infallibly, distinguished by the absence of stipules, and containing about 200 species of shrubs and herbs, natives of the north temperate zone. Many are cultivated in our gardens and shrubberies—e.g. the Honeysuckles (*Lonicera*), the Snowberry (*Symphoricarpos racemosus*), the Guelder Rose or Snowball (*Viburnum Opulus*), the Wayfaring Tree (*V. lantana*), the Laurustinus (*V. tinus*), the Elder (*Sambucus niger*), and the beautiful *Diervilla* (*Weigelia*) *rosea*, introduced from China or Japan. The charming little *Linnæa borealis* is one of the rarest of British plants, but common in parts of North America.

Caprimulgidæ. See GOATSUCKER.

Caprivi, GEORG LEO, GRAF VON, German imperial chancellor, was descended from a family originally Friulian, which settled in Silesia in the 17th century, and is sometimes called Caprivi de Caprara de Montecuculi. Count Georg Leo, born in Berlin, 24th February 1831, entered the army in 1849, fought in the campaigns of 1864 and 1866, and in the Franco-German war of 1870 was chief of the staff to the 10th Army Corps. In 1883–88 he was at the head of the Admiralty; in 1888 he became commander of his old army corps. On the fall of Bismarck, in 1890, he became imperial chancellor and Prussian prime-minister. His chief measures were army bills and a commercial treaty with Russia; in 1894 he resigned. He died 6th February 1899. See his *Reden*, with Life by Arndt (1893).

Caproic, Caprylic, and Capric Acids are represented by the formulæ $\text{HC}_6\text{H}_{11}\text{O}_2$, $\text{HC}_8\text{H}_{15}\text{O}_2$, and $\text{HC}_{10}\text{H}_{19}\text{O}_2$, and are members of the acetic or fatty-acid series. They derive their names from *capra*, 'a goat,' in consequence of their more or less resembling in smell the odour of that animal. They may all be obtained from butter by pressing out the portion which remains liquid at 15.5°C ., saponifying this oil, and distilling the soap which is thus formed with sulphuric acid. The liquid

which passes over contains, along with butyric acid, these three acids, which, by being converted into baryta salts, are separable from one another. All three of these acids are also obtained by the oxidation of oleic acid by nitric acid; and capric acid is also obtained by acting upon oil of rue with fuming nitric acid; hence it is frequently called *rutic acid*. Each acid forms a series of salts, Caproates, Caprylates, and Caprates; but the inorganic ones, such as those containing barium, potash, and soda are of little importance. The Ethyl and Methyl salts, however, resemble each other, and by virtue of their pine-apple flavour, similar to that of Butyric Ether (q.v.), are sometimes used in making artificial fruit-essences.

Capsella. See SHEPHERD'S PURSE.

Capsicum, a genus of Solanaceæ, yielding the powerful condiment variously known as Pod Pepper, Red Pepper, Guinea Pepper, Chillies, Capsicum, &c. The species are all of a shrubby, bushy, appearance, and have more or less woody stems, although they are annual or biennial plants. Some of them are in very general cultivation in tropical and subtropical countries for their fruit, which is extremely pungent and stimulant, and is employed



Capsicum annum.

in sauces, mixed pickles, &c. (*Chillies*), or dried and ground (*Cayenne Pepper*). It aids digestion, and prevents flatulence; while it furnishes a useful local stimulant, used especially as a gargle, and sometimes also as a liniment. The so-called *capsicin* is a mixture of resinous and fatty matters, with a volatile alkaloid. The species and varieties are not easily discriminated.

Capsule, in Botany, a dry fruit, formed of several united carpels (syncarpous). When the placentation is parietal or free-central (see PLACENTA), the capsule is of course one-celled; when axile, it is two or more celled. It may open by valves variously placed (see DEHISCENCE), as in foxglove, primrose, and rhododendron; or by pores, as in the poppy or snapdragon; or by a circular slit, as in the pimpernel or monkey-pot (see FRUIT). In bryophytes (see MOSSES, LIVERWORTS) the capsule in which the spores are borne is really, with its stalk, the sporophyte generation. Growing from the fertilised ovum, it carries the top of the archegonium upwards as a cap (calyptra), and sends its 'foot' down into the tissues of the parent moss-plant.—The word is also applied to gum envelopes for nauseous medicines, to metallic covers for bottles, and to little saucers used in chemistry.

Captain, MILITARY, originally a *head* or *leader*, irrespective of the number of men under him, but now a company or troop commander. In the

German army, where the infantry companies consist of 250 men each, the captain was a mounted officer; in the British army he marches on foot with his men, who look to him for everything, both in barracks and in the field. The cavalry captain belongs to a squadron, of which there are three in a regiment (four in the Indian army), each commanded by a major (see REGIMENT). The Royal Artillery and Royal Engineers used to have 'first-captains' and 'second-captains'; these ranks are now major and captain. In the Royal Engineers and the Indian army officers are promoted to the rank of captain after ten years' and nine years' service respectively, whether in command of men or otherwise employed. In the other arms promotion only takes place when a vacancy occurs. The officers of the Army Service Corps, the Royal Army Medical Corps, and the Army Veterinary Service have now combatant rank, and pass through the rank of captain. In other departments some of the officers rank as captains, but without the title. Honorary rank of captain is given to some quarter-masters, riding-masters, &c. The badges of rank are three stars on each shoulder-strap.

In Spain and some other countries the rank of *Captain-general* is still retained, and is a very high command. In Queen Elizabeth's reign there was a captain-general of footmen, and Marlborough was Captain-general of the Forces. See COMMISSIONS (ARMY), also PURCHASE SYSTEM.

Captain, NAVAL, is the general designation for the officer in command of a ship of the royal navy, although some vessels of war are commanded by officers lower in rank than captain. Captains rise to the command of larger ships, with increase of pay, according to length of service. The captain is responsible for everything on shipboard, in discipline, navigation, equipment—all, in short, that concerns the *personnel* or *matériel* of the ship. If his ship belongs to a particular fleet or naval station, he is responsible to the admiral or commodore; if not, he is directly responsible to the Admiralty. The captain of that particular ship in a fleet which carries the admiral is called Flag-captain, and has local precedence over the others. The number of captains in the naval service on the active list is limited to one hundred and seventy-five, most of whom are employed. They rank with lieutenant-colonels in the army (in the United States, with colonels); and after three years' service, with colonels. Post-captain is an obsolete title for a captain of three years' standing.

The Captain of the Fleet is a staff officer in large fleets; he promulgates the admiral's orders, and receives all the reports and returns, together with the Chief of the Staff. Among the seamen on board a ship, the chief of each gang is called captain—such as the captain of the fore-castle, of the hold, of the maintop, of each gun, &c. For half-pay captains, see HALF-PAY.

Capua, a fortified city of Italy, beautifully situated in a rich plain, on the left bank of the Volturno, 27 miles N. of Naples by rail. It has a fine cathedral, with a crypt and twenty-four ancient Corinthian columns from ancient *Casilinum*, upon whose site Capua was built in the 9th century; an antiquarian museum (1874); and a tower commemorating the sanguinary storming of the city by Caesar Borgia in 1501. Population, 15,000.—The ancient *Capua*, which for wealth and population ranked second only to Rome and Carthage, was situated $3\frac{1}{2}$ miles SE. of the present city, its site being occupied by the modern town of Santa Maria di Capua Vetere. It was founded by the Etruscans under the name of *Volturnum*, and was the chief of their twelve cities in this part of Italy. Its present name was derived from the

Samnites, who captured it in 423 B.C. After the battle of Cannæ, 216 B.C., the popular party opened the gates to Hannibal, whose army was greatly enervated by its luxurious winter-quarters here. The Romans obtained possession of the city in 211 B.C. In the 5th century A.D. Capua was devastated by the Vandals under Genseric. It recovered its prosperity again to some extent, but it was totally destroyed by the Saracens in 840. The citizens, who had fled to the mountains, were induced by their bishop to return some sixteen years later, and found the modern Capua. From the existing remains of the walls and fortifications of ancient Capua, it has been estimated that it had a circumference of 5 or 6 miles. It had seven gates. Among the Roman antiquities, one of the most remarkable is the amphitheatre, built of bricks, and faced with white marble. Well-preserved arches, corridors, and seats for spectators still remain. Measuring 557 by 459 feet, and 150 feet high, it could hold 60,000 spectators, and must have been one of the most magnificent buildings of the kind in Italy.

Cap'uchin Monkey, or CAI, a name often given to *Cebus capuchinus*, and some other species of the genus *Cebus*, South American monkeys, which have the head covered with short hair, so disposed as to resemble the cowl of a capuchin, the face being almost naked, or only covered with a little down. *Pithecia chiropotes*, a South American monkey of a genus allied to *Cebus*, is also sometimes called the Capuchin of the Orinoco. *Cebus fatuellus* is known as the Brown Capuchin. The capuchin frequents wooded country in Guiana, Venezuela, and Peru; it keeps for the most part to trees, except when pillaging maize-fields or the like; it is very shy, but easily tamed when young. Though the senses of sight and hearing are poor, its intelligence is very considerable, and can readily be educated. The mothers exhibit great affection for their young, and the captives soon become fond of their owners. As usual they are very thievish, inquisitive, and mischievous.

Cap'uchins, a branch of the order of Franciscans (q.v.), so designated from the *capuche* or cowl worn by them as their head-dress.

Capulets and Montagues, the English forms of the names of the Cappelletti and Montecchi, two noble families of northern Italy, according to tradition of Verona, chiefly memorable from their connection with the legend on which Shakespeare founded his tragedy of *Romeo and Juliet*. The first publication in which we recognise the essential incidents of Shakespeare's play is a novel by Luigi da Porto, printed at Venice in 1555. Another version was given by Bandello in 1554, and soon after a French version of the tale, by Pierre Boistean, in Belleforest's *Histoires Tragiques*, which was translated into English in 1567, and published in vol. ii. of Paynter's *Palace of Pleasure*. Boistean's novel had already in 1562 been formed, with considerable alterations and large additions, into an English poem of four thousand lines by Arthur Brooke, entitled *The Tragical History of Romeus and Juliet*, written first in Italian by Bandell, and now in English. There is evidence that an English play had appeared previously, and that before Shakespeare's time the story was so well known in England that it had supplied subjects for tapestries. Shakespeare's play seems to have been principally based on the English poem, almost the only variations being the compression, for dramatic effect, of the action from four or five months into as many days, and the bringing in of Paris to die at Juliet's bier by the hand of Romeo. But Shakespeare's faithfulness in following his text does not detract at all from the magnificent dramatic

intuition by which the old story has been fused into a tragedy of transcendent splendour and pathos.

Caput Mortuum (Lat., 'dead head'), a phrase used by the old chemists for the residuum of chemicals after the volatile substances had escaped. It is still used metaphorically for a thing or institution which has been really destroyed though the form is left, the essence and valuable characters having been removed.

Capybara (*Hydrochaerus capybara*), the largest living rodent, nearly allied to the guinea-pig. It is as large as a small pig, aquatic in its habits,



Capybara (*Hydrochaerus capybara*).

vegetarian in its diet, and often does great damage in sugar-cane plantations. It runs clumsily, but swims well, and can remain several minutes under water. The general structure is that of the guinea-pig, and differs but little except in having a grooved upper incisor tooth, and the last molar larger than those in front, and in the development of a web on the feet. It is a very plump animal, with coarse, thin, predominantly brownish hair; is inoffensive and easily tamed; and lives in pairs or families, in marshy places by rivers and lakes. Its habitat is the north of South America. It is sometimes called the water-hog, which is a literal translation of its technical title. In Demerara it is called water-horse, a corruption of *water-haas*, Dutch for 'water-hare.' The flesh, except of old males, is good for eating.

Carabidæ, a tribe of beetles, or coleopterous

insects, of the section Pentamera (see COLEOPTERA). The species are extremely numerous, those already known numbering about tenthousand. They mostly feed at night on other insects, worms, snails, &c., and are extremely voracious and active, habits which are fully shared by their larvæ. One form at any rate, *Zabrus gibbus*, is exceptional in its vegetarian diet, and sometimes does con-



Mormolyce phyllodes.

siderable damage in wheat-fields. Some of them burrow in the earth; most of them live under stones, under the bark of trees, among moss, &c.; and their bodies are adapted to this mode of life, being very firm and hard. Their legs are in general pretty long, having on the anterior pair often

brush-like soles, and much more efficient than their wings. Some of them indeed are wingless, or have only rudimentary wings. Many exhibit much beauty of colour and metallic lustre. When irritated they eject an irritant, strong-smelling fluid from glands situated posteriorly (see BOMBARDIER BEETLE). The Carabidæ occur everywhere, even in the arctic regions, and blind forms occur in caves. With extremes of temperature they become readily dormant. The largest British species is only about an inch long, but some foreign ones are much larger. Some of the species of Carabus are among the most common British insects. Their wings are not fitted for flight.—A very large and singular insect of this tribe is *Mormolyce phyllodes*, a native of Java, which, in consequence of the extremely depressed form of its body and the expansion of its wing-cases, resembles some of the Mantidæ (q.v.) and the insects known as Leaf-insects (q.v.).

Carabo'bo, a state of Venezuela, between the Caribbean Sea and the state of Zamora; area, 2000 sq. m.; population, 125,000, mostly inhabiting the fertile depression of Lake Valencia, where large crops of coffee, sugar, and excellent cacao are grown. Capital, Valencia (q.v.); chief port, Puerto Cabello (q.v.).

Carabou. See REINDEER.

Caracal (*Felis* or *Lynx caracal*), a species of Lynx (q.v.) found in the warmer parts of Asia and throughout the whole of Africa; and more probably than any European species the lynx of the ancients. It is larger than a fox, about the same height, but much more powerful; of a uniform



Caracal (*Lynx caracal*).

deep chestnut or wine-red colour, except two spots near each eye, the under parts of the body, and inner parts of the legs, which are white, and tufts of long black hair which terminate the ears. The young forms are spotted. The ears are about 3 inches in length. The caracal is powerful enough to tear a hound to pieces. It is often represented as of a very savage disposition, and certainly is most ill-tempered or probably semi-insane in captivity, but is capable of being tamed, and is in India employed for hunting hares and rabbits.

Caracalla, Roman emperor from 211–17 A.D., the son of the Emperor Septimius Severus, was born at Lyons, 188 A.D. He was originally named *Bassianus*, from his maternal grandfather, but his legal name, as it appears on medals and inscriptions, was *M. Aurelius Antoninus*. *Caracalla* was a nickname given him from his favourite dress, a long hooded tunic, made in the fashion of the Gauls, and so called in their language. After his father's death at Eboracum (York) in 211 A.D. he ascended the throne as co-regent with his brother Publius Septimius Antoninus Geta, whom he after-

wards caused to be murdered. He next directed his cruelty against all the friends and adherents of Geta, of whom it is said as many as twenty thousand of both sexes—including the great jurist Papinianus—were put to death. Innumerable acts of oppression and robbery were employed to raise supplies for the unbounded extravagance of the despot, and to pay his soldiers. In his famous constitution he bestowed Roman citizenship on all his free subjects not citizens—who formed the majority, especially in the provinces—but simply in order to levy a greater amount of taxes on releases and heritages, which were paid only by citizens. After almost exhausting Italy by his extortions, he turned to the provinces, which had been in a great measure spared by the tyranny of former emperors. In 214 he visited Gaul, Germany, Dacia, and Thrace; and after a campaign against the Alemanni, assumed the surname *Alemannicus*. He was assassinated, at the instigation of Macrinus, prefect of the Praetorians, by one of his veterans named Martialis, on the 8th of April 217, on the way from Edessa to Carrhæ. All the historians combine to paint the life of Caracalla in the darkest colours. Among the buildings of Caracalla in Rome, the baths—Thermæ Caracallæ—near Porta Capena, were most celebrated, and their ruins are still magnificent.

Caracara, a Brazilian name applied to several of the falcon-like hawks, and especially to *Polyborus braziliensis*. The name refers to the hoarse cry. They keep a good deal to the ground, and a web joins the base of the two outer toes to the middle one. Ibycter is a closely allied genus, and the southern caracara (*Ibycter australis*) the best-known species. Darwin, in his *Beagle* voyage, gives an interesting account of their mischievous and passionate habits. The bare skin of the face changes in colour according to the flow of blood associated with emotion. *Ibycter australis* frequents the



Caracara.
(*Polyborus braziliensis*).

Falkland Islands; *Polyborus braziliensis* spreads from Brazil over a large extent of America, and even reaches occasionally the southern parts of the United States.

Carácas, the capital of the republic of Venezuela and of its Federal District, is beautifully situated in a nook in the mountains, 6 miles S. of La Guaira, its port. Built on the southern slope of the Avila (8635 feet), it is 3025 feet above the tide-level, and enjoys from this elevation a healthy air and a temperature ranging between 48° and 100° F. The streets, built at right angles, are broad and well paved. There are a handsome promenade, numerous public parks and gardens, and a statue of Bolívar; the town has excellent water and gas, electric light, telephones, electric tramways, and is the terminus of several railways. The most notable edifices are the Federal Palaces and other official buildings, including the president's 'Yellow House'; the university, whose library is open to the public; the archiepiscopal palace; the national museum; the Exhibition Palace (see BOLÍVAR); the cathedral; the magnificent basilica of St Ann; and over a score of hospitals and

charitable institutions. Besides the university, there are colleges of medicine, law, and engineering, and other technical schools, and several learned societies, and bodies devoted to the promotion of agriculture, industries, &c. Pop. 92,000. The Federal District, with an area of 700 sq. m., includes, besides Carácas and La Guaira, a number of other towns. Pop. 140,000. The neighbourhood is subject to earthquakes; in that of 1812, 12,000 citizens perished.

Caracci, or CARRACCI, a celebrated family of Italian painters, the founders of the Bolognese school of painting.

LUDOVICO CARACCI, the son of a butcher, was born at Bologna in 1555. As a student he was so inapt that his master recommended him to abandon the pursuit; but instead of that, he went to Venice and Parma, making acquaintance with the works of the great masters there, and returned to Bologna imbued with art principles quite opposed to the superficial mannerism then prevailing in his native city. In conjunction with two of his cousins, who, instructed by him, had imbibed the same ideas, he founded, in spite of great opposition, the Eclectic school which afterwards became so famous in the history of painting. The first principle of this new school was that 'observation of nature ought to be combined with imitation of the best masters.' The allied artists found numerous pupils, to whom they gave practical instructions in drawing from natural and artistic models, with theoretical lessons on perspective, anatomy, &c. So great was their success that in the course of a short time all other schools of painting were closed in Bologna. Some of the finest works of this master are preserved at Bologna—among others, the 'Madonna and Child Throned,' 'Madonna and Child Standing,' the 'Transfiguration,' and the 'Nativity of St John the Baptist.' He also engraved and etched a few of his own designs. Ludovico died in 1619.

AGOSTINO CARACCI, cousin of Ludovico, was born (1558) in Bologna. He became a disciple of his cousin, but he was of too versatile a genius to devote himself closely to any subject, though his magnificent painting of the 'Communion of St Jerome,' painted for the Certosa of Bologna, now in the gallery of that city, proves that he might have attained to very great eminence had he devoted his undivided attention to the art; but he was in the habit of abandoning his easel for literature, poetry, and engraving on copper. As an engraver, indeed, he holds an important position in Italian art. He accompanied his younger brother Annibale to Rome, and there assisted in some of the paintings in the Farnese Gallery; but his brother, who was a slave to his art, soon quarrelled with him for his inattention, and he left Rome, and went to Parma, where he died in 1602. As an engraver he ranks very high for his correctness of design and skill of execution.

ANNIBALE CARACCI, brother of Agostino, was born (1560) in Bologna, where he learned, under his father, the business of a tailor, from which he was called away by Ludovico Caracci. His progress in the study of painting was rapid, and at first he took principally for his models Correggio, Titian, and Paul Veronese. His picture of 'St Roche distributing Alms' first gained for Annibale Caracci a wide reputation. His fame reached Rome, and he was employed to paint the Farnese Gallery there, which is considered his greatest work, and the manner of which partakes somewhat of Raphael and Correggio. On this gallery he was employed some four years, and he received for his work the incredibly paltry sum of 500 crowns. After a visit to Naples he died in Rome in 1609, where his remains were interred, close to Raphael's tomb, in the Pantheon. His most celebrated easel-

picture is the 'Three Maries,' formerly in the Orleans collection, now at Castle Howard. Annibale Caracci was one of the greatest followers of Correggio, and in composition approached most nearly to the style of Raphael. Ludovico had a greater talent in teaching, and Agostino had a more versatile invention, but Annibale was unquestionably the greatest artist of the three Caracci.

ANTONIO MARZIALE CARACCI (1583-1618), natural son of Agostino, was a pupil under Annibale, and painted some excellent pictures.

FRANCESCO (styled FRANCESCHINO) CARACCI, nephew of Agostino and Annibale, was born in 1595, and distinguished himself as an eminent designer. He died 1622.—The best Italian masters of the 17th century—Domenichino, Guido Reni, Albani, and others—proceeded from the school of the Caracci.

Carac'ciolo, PRINCE FRANCESCO, was born in 1752 of a noble Neapolitan family, and had risen to the supreme command of King Ferdinand's navy, when in December 1798 he fled with him before the French from Naples to Palermo. Learning, however, of the intended confiscation of the estates of all absentees, he obtained permission to return to Naples, and there entered the service of the 'Parthenopeian Republic,' in April being placed at the head of its marine. For two months he ably directed the operations of the revolutionists, and not till their cause seemed hopeless, though before the capitulation, did he quit the capital. He was captured in peasant disguise, and on 29th June 1799 was brought on board Nelson's flag-ship, tried by a court-martial of Neapolitan officers, and hanged from the yard-arm of a Neapolitan frigate. See NELSON, and books there quoted (especially Laughton's); books named at HAMILTON (EMMA); Giglioli, *Naples in 1799* (1903).

Carac'tacus, a king of the Britons, for nine years (43-50 A.D.) warred gallantly against the Roman invaders, but at length was completely overthrown by Ostorius in a battle near the border of South Wales. His wife and daughters fell into the hands of the victors, and his brothers surrendered. Caractacus himself fled to Cartismandua, queen of the Brigantes, who delivered him up. He was carried to Rome, 51 A.D., and exhibited in a triumphal procession by the Emperor Claudius, who was greatly impressed by his dauntless bearing and language. According to tradition he died at Rome about 54 A.D., but there is absolutely no ground for supposing that the Claudia of 2 Tim. iv. 21 was his daughter. Sir John Rhys prefers the spelling (with accent) *Caratâcos*.

Caraffa is the name of an ancient and famous Neapolitan family, to which several cardinals and Pope Paul IV. (q.v.) belonged.—CARLO CARAFFA, nephew of Paul IV., was born in 1517, fought in the Netherlands, joined the Knights of Malta, and was made cardinal by his uncle. Paul had ultimately to banish the cardinal and his brothers from Rome for extortion; and in 1561 Pope Pius IV. caused him to be put to death. See the work by Durny (Paris, 1883), and Canon Jenkins, *The Story of the Caraffa* (1886).

Caraites. See KARAITES.

Caramania is a name sometimes given to part of the central tableland of Asia Minor (q.v.), from the town of Karaman, a town of 7000 inhabitants, lying at the northern base of Mount Taurus. It is mostly in the province of Konieh.

Carambola, or COROMANDEL GOOSEBERRY, is the fruit of *Averrhoa Carambola*, a small East Indian evergreen tree belonging to the Oxalidaceæ. Its congener, *A. Bilimbi*, yields the acid fruit

known as the Bilimbi or Blimbing, and both species have been introduced into cultivation in the West Indies. They exhibit in a tolerably marked degree that sensitiveness familiar in other members of the order. See SLEEP OF PLANTS.

Carambole. See BILLIARDS.

Caramel is the name applied to the highly flavoured dark-brown substance produced by the application of heat to Sugar (q.v.). It is likewise formed during the roasting of all materials containing sugar, such as coffee, chicory, and malt (see BEER), and is one cause of the dark colour of porter and infusions of coffee. It is employed in the colouring of whisky, wines, vinegar, &c. Although caramel, as prepared by burning sugar, is used more as a colouring than as a flavouring agent, yet it, and bodies allied to it, play a very important part in nutrition. When meat is roasted, a very highly flavoured brown portion is produced on the surface. It is to this, a form of caramel, that the appetising flavour of roast meat is in part due, while to the same cause we can trace the distinctive flavour of toasted bread. The dark coloured gravy derived from roast meat owes its value in part to caramel; and recognising this, the cook frequently adds caramel or browning, as it is called, to make up for deficiencies. Experiments have shown that while life cannot be sustained on the tasteless fibrous meat from which the juices have been removed by water, yet the addition of caramel enables it to be assimilated as food.

Caran d'Ache (French spelling of the Russian for 'lead-pencil'), the name by which Emmanuel Poiré (1858-1909) chose to be known as a caricaturist. Born in Moscow, the grandson of a French prisoner of 1812, he settled in France, became a draughtsman in the War Office, and was soon known by his caricatures in various periodicals. Collections of his work appeared in *L'Album* and *Les Maitres Humoristes* (1907). Some of his later caricatures were toy pictures cut in thin wooden board.

Carapace, a term applied to the shield on the back of such crustaceans as Crab and Lobster, of the unique King Crab or Limulus, or of chelonians like Tortoise and Turtle. In the former cases it is a chitinous and calcareous cuticle (a product of the underlying living skin); in the last it consists of backbone and ribs, added to by dermal scutes and covered with epidermic scales.

Carat. Goldsmiths and assayers divide the troy pound, ounce, or any other weight into 24 parts, and call each a carat, as a means of stating the proportion of pure gold contained in any alloy of gold with other metals. Thus, the gold of our coinage and of wedding-rings, which contains $\frac{22}{24}$ of pure gold, is called '22 carats fine,' or 22-carat gold. The lower standard, used for watch-cases, &c., which contains $\frac{18}{24}$ of pure gold, is called 18-carat, and so on. The carat used in this sense has therefore no absolute weight; it merely denotes a ratio. This, however, is not the case with the jewelry carat used for weighing diamonds and other precious stones, pearls, &c., which has a fixed weight, and is divided into quarters, or 'carat grains,' eighths, sixteenths, thirty-seconds, and sixty-fourths. These carat grains are less than troy grains. Even the carat with fixed weight varied in various countries—from about 216 milligrams in Leghorn to 195 in Florence. In England it was 205.4090 milligrams; in France, 205.5000. The metric carat (abbreviated C.M.) of 200 milligrams came rapidly into general use throughout the world, and in 1914 it became compulsory in the United Kingdom.

The name seems to come through the Arabic *qirrat* from the Greek *keration*, the fruit of the Carob (q.v.),

used also as a weight. The origin of the word has also been sought in *Kuara*, the native name of the *Erythrina Abyssinica*, or coral-tree, the seeds of which, it is said, were very equal in size, and were used for weighing gold and precious stones.

Caravaca, a town of Spain, 40 miles NNW. of Murcia, in a rich wine country, has manufactures of woollen fabrics, soap, paper, leather, brandy, and oil. Pop. 16,000.

Caravaggio, a town in the Italian province of Bergamo, 3 miles SE. of Treviglio by rail. It has a famous church, *L'Apparizione della Madonna*, to which pilgrimages are made, and is celebrated as the birthplace of the painters Fermo Stella, Polidoro Caldara, and Michelangelo Merisi, all three surnamed Caravaggio. Pop. 9000.

Caravaggio, MICHELANGELO MERISI, or MORIGI DA, a celebrated Italian painter, was born in 1569 at Caravaggio (see above). His father, who was a mason, employed him in preparing plaster for the fresco-painters of Milan, and in this way the artistic genius of the boy was stirred. After studying the works of the great masters in that city for five years, and afterwards in Venice, where his colouring was for a time influenced by the paintings of Giorgione, he went to Rome, where he lived for some time in very reduced circumstances. At length a picture of his attracted the notice of Cardinal del Monte, who now patronised the young artist; his works became for a time popular, and even such painters as Guido and Domenichino found it necessary to imitate his style. But the ferocious and quarrelsome character of Caravaggio soon involved him in difficulties. Having fled from Rome to Malta on account of manslaughter, he obtained the favour of the Grand-master by painting an altar-piece in the church of St John, and other pictures. His fiery nature soon forced him to flee from Malta; and in making his way back to Rome, he was wounded, lost all his baggage, caught a violent fever, and on reaching Porto Ercole, lay down on a bank and died (1609), at the age of forty. Transcript of ordinary and often debased nature was the object aimed at by Caravaggio, who left the schools, and devoted himself to painting life as he found it in lanes, alleys, and other resorts of the lower classes. He studied no such matters as refined sentiment or the elevation of realities, but gave in his paintings expression to his own wild and gloomy character. His chiaroscuro is forced and untrue, but very effective. When he painted sacred subjects, he still remained faithful to the low realities of Italian life; so that several of his pictures executed for churches had to be removed from their places, on account of their want of harmony with sacred surroundings. Kugler, the German critic, has justly said of one of Caravaggio's most celebrated works, a 'Burial of Christ,' that it appears 'like nothing better than the funeral of a gypsy-chieftain.' One of his best paintings, 'The Fraudulent Gamblers,' is preserved in the Sciarra Gallery at Rome; his 'Christ and the Disciples at Emmaus' is in the National Gallery, London; and several of his works are in the Berlin Museum. See monograph by G. Rouchés (Paris, 1920).—For an earlier and less celebrated Italian painter, POLIDORO CALDARA DA CARAVAGGIO, see CALDARA DA CARAVAGGIO.—The name is shared by yet another painter, FERMO DA CARAVAGGIO, otherwise Fermo Stella.

Caravan (Persian *kârwan*), in Africa and the East, a large company of travellers associated for mutual help and protection. Caravans following a sandy desert route employ camels, sometimes as many as 1000, which follow each other in single file; in journeys through a steep and rocky country, mules and asses are used. The term is pro-

perly confined to trading assemblages alone; for the caravans formed by pilgrims going to Mecca, the most famous of which are those which annually assemble at Cairo and at Damascus, see HAJJ. In trade-caravans, a leader, who is called *Karwan-Bashi*, or simply *Reis* ('chief'), is elected by the merchants from their own number. The leader of the Mecca caravans is called *Emir-el Hajj* ('prince of the pilgrims').

CARAVANSERAI, or KHANS, are the buildings erected in the East, generally as a pious charity, for the shelter of caravans or travellers; they are unfurnished, water only being provided. Generally erected just outside the walls of a town or village, they commonly consist of a square building of four wings built round a court-yard, in which the beasts of burden may be inclosed, and where there is usually a well, with a fountain-basin beside it; the lodgings are small rooms, generally on a second story, built over the arcade and storerooms which run round the court-yard. Always massive and strong, the buildings are often handsome and well proportioned; but in too many instances they have been allowed to sink into dilapidation and even ruin.

From 'a moving company, cavalcade, company in motion—e.g. out for a picnic,' *Caravan* had come in 1689 to mean a large covered car or conveyance capable of carrying such a company. Thence the transition was easy to the 'chimined house on wheels' of the Gypsy, the showman, or Dr Gordon Stables; and caravanning is now an accepted form of holidaying—as in the Countess von Arnim's *Caravaners* (1909).

Caravellas, a Brazilian port, 475 miles NE. of Rio de Janeiro, on the Caravellas, 5 miles from its mouth. It exports fish-oil, coconuts, and coffee. A railway connects it with the interior. Pop. 4000.

Caraway (*Carum Carvi* or *Carui*), a species of Umbelliferae, which has long been cultivated in Europe and elsewhere for the sake of the well-known aromatic 'caraway seeds' which it bears; these being, however, in strictness not seeds, but the *mericarps*, into which the fruit in this order splits when ripening (see UMBELLIFERÆ). Their properties are due to the volatile caraway-oil, which is contained in the large oil-glands (*vittæ*) of the fruit, and is distilled on a large scale, chiefly for the preparation of the liqueur known as *kümmel*, but also for use in perfumery and in pharmacy, as an aromatic stimulant and flavouring ingredient. Caraways are, however, chiefly used entire as a spice by bakers and confectioners, and the cultivation of the plant thus attains considerable importance, particularly in Germany and Holland. To the same genus *Carum* belong also parsley, and ajowan, whose seeds yield thymol.

Carbides, formerly termed *carburets*, are the compounds of carbon with the various metals. It is to the addition of carbon, in one way or other, that the valuable properties of cast-iron and steel are due. For the carbide of calcium, see CALCIUM; also ACETYLENE, GAS (LIGHTING); and Leeds and Butterfield, *Calcium Carbide and Acetylene* (1903).

Carbine is a very short rifle, which until recently was carried by cavalry soldiers, and on the limbs of the horse and field artillery. These troops are now provided with the infantry rifle, and the stock of carbines is used by school cadet corps. The weapons are not sighted to so long a range as the rifle, but are of the same calibre, with a smaller charge of the cordite explosive in the cartridge.

Carbineers, or CARABINEERS, meant formerly light horsemen, used chiefly to watch and harass the enemy, defend narrow passes, and act as

skirmishers. A corps under this name was raised in France in 1560; but the designation is no longer used in that country. In the English army all cavalry were at one time often styled carbiniers, but now there is only one regiment, the 6th Dragoon Guards, known by this title; and the distinction between them and other heavy cavalry is merely nominal.

Carbohydrates, a class of chemical compounds of carbon, hydrogen, and oxygen, the two last in the same proportion as in water. See for the various members of the class the articles CELLULOSE, DEXTRINE, INULIN, STARCH, SUGAR; also DIET, DIGESTION, FOOD.

Carbohydrogens. See HYDROCARBONS.

Carbolic Acid, or PHENOL, C_6H_5OH , is one of the most important substances derived from coal-tar. Although called an acid, and forming salts, it is neutral to test-paper, and has more in common with the alcohols than with the acids (see ACIDS and ALCOHOLS). It is obtained by distilling coal-tar, reserving the portion passing over between 356° and 374° (180° — 190° C.). After rectification, this constitutes the crude carbolic acid used so largely for disinfecting purposes. By careful purification it can be obtained pure, when it forms minute white or colourless plates or needles, possessing a burning taste, and an odour resembling that of creosote. By exposure to the air it becomes pinkish, but is not otherwise injured. It rapidly absorbs water from the air, forming an oily liquid, which does not readily mix with water until about 15 volumes have been added, when it forms a solution. Carbolic acid is apt to be confounded with cresylic acid and creosote, which possess an odour somewhat similar. This remark applies only to the liquid acid, as neither of these substances can be crystallised. Liquid carbolic acid has no action on polarised light, in this respect differing from creosote. Carbolic acid is readily soluble in alcohol, ether, chloroform, glycerin, olive-oil, and volatile oils. Although called an acid, it forms but very weak combinations with the alkalies, some of the so-called carbolates used for disinfecting purposes being probably only earthy substances mixed with carbolic acid.

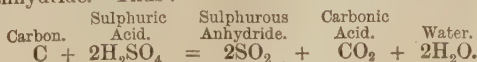
In solution carbolic acid coagulates albumen, arrests fermentation, destroys parasites, whether animal or vegetable, and prevents moulding or putrefaction. Owing to these valuable properties it has come largely into use as an antiseptic and disinfectant. Applied to the cavity of a decayed tooth it quickly relieves certain forms of toothache, acting as a local anæsthetic. Owing to its powerful action on the mucous membranes, it must not be allowed to touch the interior of the mouth. Taken internally, concentrated carbolic acid acts as an irritant poison, accompanied by a numbing of the stomach, which prevents the action of emetics. The antidote for carbolic-acid poisoning is any soluble sulphate. Medicinally, carbolic acid may be given in doses of one to three grains dissolved in glycerine or water. See ANTISEPTIC SURGERY.

Carbon (sym. C; at. wt. 12), one of the most widely diffused elements, occurs uncombined in Black Lead (q.v.), and in the Diamond (q.v.). It is much more abundant, however, in a state of combination. United with oxygen, it occurs as Carbonic Acid, CO_2 (q.v.), in the atmosphere, in natural waters, in limestone, dolomite, and ironstone. In coal it is found combined with hydrogen and oxygen; and in plants and animals it occurs as one of the elements building up wood, starch, gum, sugar, oil, bone (gelatin), and flesh (fibrin). Indeed there is no other element which

is so characteristic of plant and animal organisms, and it ranks as the only element never absent in substances obtained from the two kingdoms of organic nature. Wood charcoal, coke, lampblack, and animal charcoal are artificial varieties, more or less impure, of carbon. The specific gravity of the different forms of carbon greatly varies; that of the diamond being 3.330 to 3.550, while graphite is only about 2.300. Carbon, in its ordinary forms, is a good conductor of electricity; in the form of diamond, it is a non-conductor. Of heat, the lighter varieties of carbon, such as wood charcoal, are very bad conductors; graphite in mass has very considerable conducting powers. At ordinary temperatures, all the varieties of carbon are extremely unalterable; so much so, that it is customary to char the ends of piles of wood which are to be driven into the ground, so as by this coating of non-decaying carbon to preserve the interior wood; and with a similar object, the interior of casks and other wooden vessels intended to hold water during sea-voyages, is charred (coated with carbon), to keep the wood from passing into decay, and thereby to preserve the water *sweet*. Even as regards combustion there is a marked difference. Wood charcoal takes fire with the greatest readiness, bone-black (animal charcoal) less so; then follow in order of difficulty of combustion—coke, anthracite, lampblack, black lead, and the diamond. Indeed, black lead is so non-combustible, that crucibles to withstand very high temperatures for prolonged periods without breakage or burning, are made of black lead; and the Diamond (q.v.) completely resists all ordinary modes of setting fire to it. In the property of hardness carbon ranges from the velvet-like lampblack to diamond, the hardest of gems. In 1879 it was announced that a method of producing pure crystallised carbon, or diamond, had been discovered, but, so far, the artificial crystals obtained have only been of small size. See MOISSAN.

Besides the physical properties already alluded to, carbon possesses very remarkable absorbent powers; enabling it not only to decolourise syrupy liquids (see CHARCOAL, ANIMAL), but also to absorb gases. Thus freshly ignited wood charcoal will absorb ninety times its own volume of ammonia gas, and sixty-five times its volume of sulphurous anhydride gas. Owing to this property it has many important uses. When employed in the construction of respirators, so arranged that the air is drawn through a layer of charcoal, it is possible to breathe an atmosphere which otherwise would be irrespirable. Water and wine which have become tainted may be readily rendered wholesome by means of charcoal; while as a tooth-powder its value lies in the absorbent power referred to. But see BISCUITS. Gardeners find that when it is mixed with potting-soil it prevents the souring of the soil, which is so injurious to the finer varieties of plants.

Most of the filters so much in use nowadays for the purification of water contain charcoal, which not only removes organic matter, but even lessens the hardness of the water. For decolourising liquids bone-black is preferable. The varieties of carbon, as mentioned above, differ very considerably in the readiness with which they combine with oxygen; but when burned they all yield Carbonic Anhydride, CO_2 (see CARBONIC ACID). Carbon forms another oxide, called carbonic oxide, CO, when it is burned with only a limited supply of air. When heated with sulphuric acid carbon decomposes it, forming carbonic acid and sulphurous anhydride. Thus:



Carbon unites with metals to form Carbides (q.v.), the chief of which are those of iron. With hydrogen carbon forms a very important class of organic compounds, including such unlike substances as turpentine, oil of lemon, $C_{10}H_{16}$, and marsh gas, CH_4 . As carbon unites with nearly all the elements to form chlorides, bromides, &c., the number of carbon compounds is virtually unlimited (see AROMATIC SERIES), and those already known far surpass in numbers all other chemical compounds put together. When carbon is obtained sufficiently dense, it is found to be a good conductor of electricity, and to make an excellent electro-negative element in a galvanic pair. For this purpose graphite and the hard incrustation of carbon found in gas retorts are admirably suited; but, owing to their comparative scarcity, recourse is had to an artificial method of preparing dense carbon, devised by Professor Bunsen of Heidelberg. The carbons thus obtained for galvanic batteries, owing to their efficiency and cheapness, have given a great impetus to electrical work. The following are the more important steps in the process: A mixture of two parts of coke and one of coal in powder is placed in an iron mould and heated in a furnace. As soon as the liberation of gas has ceased, the mould is allowed to cool, and on opening it a carbon block is obtained which may be ground to the desired size. Although hard, it is still far too porous, and to remedy this it is soaked in thick gas-tar, allowed to dry, and finally heated in a fireproof crucible for some time. A second or even third time this may be repeated, care being taken to prevent the access of air to the crucible, and eventually a carbon very dense, sonorous when struck, and a good conductor of electricity, is obtained.

For a reference to the manufacture of charcoal, see separate article; and see ELECTRIC LIGHT.

Carbona'do, a form of carbon resembling hematite, but akin to the diamond, used like black diamonds in Boring (q.v.). See DIAMOND.

Carbonari (literally 'colliers' or 'charcoal-burners'), the name of certain secret societies, which flourished both in Italy and France at the beginning of last century. The aim of the societies was the overthrow of the despotic and reactionary governments then existing. They originated in Italy while under the rule of the Bonapartes. Botta, in his *Storia d'Italia*, states that, under Murat's government, the Neapolitan republicans, equally hating the French and King Ferdinand, escaped about 1808 into the wild defiles of the Abruzzi, and here, naming themselves 'Carbonari,' formed a secret society. The name of Carbonari was taken from the trade of charcoal-burning pursued in that part of Italy, and a great deal of the peculiar phraseology used in reference to their organisation and their proceedings was drawn from the same source. Thus one of their lodges was called a hut (*baracca*); an ordinary meeting, *vendita* (a sale); a meeting of great importance, *alta vendita*. But much of their ceremonial and phraseology was drawn from freemasonry and the Christian religion. Their motto or war-cry was 'Vengeance for the lamb torn by the wolf.' There were four grades in the organisation, with mystic rites of initiation. The name has been more recently extended to the revolutionary and republican organisations of Spain and Portugal.

The Carbonari played a considerable part in Italian history. Murat, the Bonapartist king of Naples, repressed them for a time, their leader Capobianco being put to death; yet they helped to overthrow French rule in Southern Italy. After the Bourbon restoration in 1815 the discontent continued, and Carbonarism attained to its greatest degree of prosperity. Priests, officers of the army,

and even women joined the organisation, which included among its members Charles Albert (afterwards king of Sardinia), Lord Byron, Silvio Pellico, and Mazzini. In 1820 its membership, variously estimated at 300,000 and 700,000, included most of the patriotism and intelligence of Italy. But its strength was broken through the unsuccessful risings of 1820 and 1821, the power of Austria and of the reaction being too great for revolutionary Italy. Subsequently the more active portion of the revolutionary party in the peninsula was absorbed by the 'Young Italy' movement (1831) of Mazzini.

After the restoration of the Bourbons several secret political unions were formed in France, and in 1820 were confederated with the Carbonari. Paris, after the prosecutions against the secret societies of Italy, was made the headquarters of a Carbonarism which, adopting all the symbolic phraseology, rules, and regulations of the Italian societies, received from the rapidly systematising genius of the French an organic character which it had never before possessed. Lafayette was president of the supreme board, and many students and inferior officers in the army joined the societies. The initiated styled themselves *bons cousins*, and spoke of the uninitiated as *pagani* (heathens). Written documents and communications were strictly prohibited by the heads of the union, and treachery was to be punished by assassination. Following the example of their Italian brethren, the French Carbonari in 1821 attempted risings in several towns in France. Though unsuccessful, they revealed the considerable numbers and effective organisation of the societies, and they survived in sufficient strength to take a part in the revolution of July 1830. After that event several of the leading French Carbonari attached themselves to the new régime, and their society was gradually dissolved. In its place the new *Charbonnerie Démocratique* was founded, having for its object the establishment of a republican government on the communistic principles of Babeuf (q.v.). But this form of Carbonarism did not long continue. Since 1848 Carbonarism generally has disappeared. The discontent that produced it has either been satisfied by the concession of constitutional government, or has found expression in later phases of the revolutionary movement. See Heckethorn's *Secret Societies* (1875; new ed. 2 vols. 1897).

Carbonated or Acidulous Waters are those which contain a great excess of carbonic acid gas. They may be divided into the artificial and the natural. The former are treated of under Aerated Waters (q.v.), and the latter under Mineral Waters (q.v.).

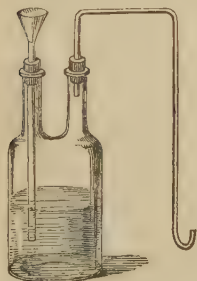
Carbondale, a city of Lackawanna county, Pennsylvania, on the Lackawanna River, 16 miles NNE. of Scranton by rail, with foundries and planing-mills, and rich beds of anthracite coal. Pop. 19,000.

Carbonic Acid, CARBON DIOXIDE, or CARBONIC ANHYDRIDE, also called Fixed Air or Chokedamp, exists as a normal constituent of the atmosphere, of which it forms about $\frac{1}{10000}$ part. While enormous quantities of it are poured into the atmosphere by the respiration of animals and by the combustion of fuel in our furnaces, this proportion scarcely seems to vary; for, as plants absorb carbonic acid by the leaves, and therefrom obtain the carbon necessary for the formation of wood, they remove it as fast as it is produced, and thereby keep the atmosphere in a state suitable for animal life. Carbonic acid also exists in combination as *carbonates*, the most largely distributed of which are the carbonate of lime, $CaCO_3$, either alone, or in combination with mag-

nesium as *dolomite*, the blackband ironstone (carbonate of iron, FeCO_3), malachite (basic carbonate of copper, $\text{CuH}_2\text{O}_2, \text{CuCO}_3$), &c. The term *carbonic acid* is hardly a correct one, and it is better to call the gas, CO_2 , carbon dioxide or carbonic anhydride, reserving the term carbonic acid for the solution in water. The gaseous carbonic acid is represented by the formula CO_2 , and contains 12 parts of carbon and 32 parts of oxygen by weight. It is a very dense gas, having a specific gravity of 1.529, that of air being 1.000. In consequence of this it can be poured from one vessel to another like a liquid; while in vats in which it is being disengaged by fermentation, it remains at the bottom, for some time even when freely exposed to the air, giving rise to fatal accidents when workmen carelessly enter them. Carbonic acid is a colourless gas, possessing a pleasant acidulous taste. Under a pressure of about forty atmospheres (600 lb. per square inch) it becomes condensed to a liquid. When the liquid carbonic acid is allowed to escape through a small jet, it rapidly evaporates and produces intense cold, with the result that a certain portion becomes frozen into a solid resembling snow. The solid carbonic acid volatilises without becoming liquid, and by the low resulting temperature produces strange phenomena. Thus when pressed on the skin it produces the sensation of burning, and when thrown into a hot crucible along with mercury, the latter (under suitable conditions) becomes frozen into a solid mass.

At ordinary pressures carbonic acid is soluble in about its own bulk of water, its solubility increasing with increased pressure. This property is taken advantage of in the manufacture of Aerated Waters (q.v.). Carbonic acid is used in the sugar industry and in the artificial preparation of ice. It is non-combustible, and it does not support combustion or animal life. A lighted taper is immediately extinguished when plunged into a vessel containing carbonic acid, and this simple experiment is used to test if workmen may safely enter a vat which has contained the gas. Although irrespirable by itself, acting as it does, like water, by causing spasm of the glottis, it can be breathed when diluted with air, and in such circumstances it acts as a narcotic poison, even so small a proportion as 4 per cent. acting rapidly. In much less quantity it causes depression and headache, but in aerated water works, where carbonic acid gas is liberated in quantity, it has never produced this effect, probably owing to the efficient ventilation. The French suicides who make use of a charcoal fire to terminate their existence, are partly poisoned by the carbonic acid, and partly by the Carbonic Oxide (q.v.) produced by the burning carbon.

Carbonic acid may be very readily prepared from chips of marble, water, and hydrochloric acid, which



are placed in a glass bottle furnished with suitable tubes (see fig.). The hydrochloric acid, HCl , acts on the marble, CaCO_3 , forming chloride of calcium, CaCl_2 , and water, H_2O , while the carbonic acid gas, CO_2 , escapes with effervescence, and may be collected in suitable vessels. Carbonic acid, as indicated before, is the principal product of combustion; the carbon of the burning substance (wood, coal, paper, coal-gas, &c.) uniting with the oxygen of the air to form carbonic acid. It is also a product of Respiration (q.v.), and is evolved more or less largely by all animals not only by the lungs, but also by the skin. During the Fermentation (q.v.)

of beer or wine it is liberated, while decaying vegetable or animal matters give off the gas in quantity. There is a popular prejudice against having plants in a bedroom during the night-time. This is based on the fact that plants give off carbonic acid in the dark, while they absorb it during the day. Plants also liberate carbonic acid during the flowering season, but the total amount from these two sources is so very small, that a single gas-burner will vitiate the air of a room more rapidly than a large collection of plants. The prejudice based on the carbonic acid theory seems therefore to be practically groundless. Carbonic acid forms two classes of salts, called *carbonates* and *bicarbonates*. The bicarbonates differ from the carbonates in containing twice as much carbonic acid gas relatively to the base. Thus carbonate of soda, Na_2CO_3 , may be regarded as consisting of soda, Na_2O , and carbonic acid, CO_2 ; while the bicarbonate, represented in the same way, would be $\text{Na}_2\text{O} + \text{H}_2\text{O} + 2\text{CO}_2$, or shortly, 2NaHCO_3 (see SODA, SODIUM). The bicarbonates very readily lose the extra molecule of carbonic acid, yielding then the ordinary carbonate. For the carbonates of potash and of iron, see POTASH, IRON.

The bicarbonate of lime is interesting as being the form in which most of the lime present in drinking water is held in solution. When the rain, impregnated with carbonic acid from the atmosphere, or charged with the gas from subterranean sources, percolates down through a chalky soil, it dissolves the chalk, or carbonate of lime, CaCO_3 , forming a bicarbonate, and thus becomes what is known as a *hard* water. Such a water may be readily *softened* by boiling, when the carbonic acid escapes, and the chalk, no longer soluble, falls to the bottom. This gives rise to the domestic phenomenon known as the furring of the kettle. A solution of slaked lime in water (the lime-water of the shops) forms a ready test for carbonic acid. Thus, if a little be placed in a wine-glass, and a steady stream of expired air from the lungs be blown into it, a turbidity will soon be noticed, due to the formation of carbonate of lime. On continuing to blow, the carbonic acid dissolves this up, and a clear solution of bicarbonate is obtained.

Other carbonates, such as those of silver, iron, copper, baryta, &c., are not of sufficient importance to warrant further notice here.

Carbonic acid in solution forms a refreshing drink in feverish states of the system, while in nausea and gastric irritation its value is very considerable. It acts also as a diuretic, and probably, when taken in moderation, as a stomach tonic. Owing to its sparkling properties it is used to conceal the taste of many drugs; and the granular effervescing preparations, such as citrate of magnesia, now so widely known, have come into use mainly on account of the ease with which nauseous drugs may be administered under the guise of an effervescing drink. In the form of gas, carbonic acid is said to be beneficial in the irritable states of the larynx, owing to its exercising a slight local anæsthetic action.

The carbonates possess mainly the medicinal properties of the bases, than which they are less irritating, the soda, potash, lime, and magnesia salts being recognised antacids. The magnesia salt, in the form of the bicarbonate, is well known as 'fluid magnesia,' which possesses both antacid and aperient properties.

Carbonic Oxide is the lower oxide of Carbon (q.v.), and is represented by the formula CO . It consists of 12 parts by weight of carbon and 16 parts of oxygen. It does not occur naturally, but may be observed burning with a pale-blue flame in fireplaces and stoves, especially in frosty weather. During the combustion of the fuel at the

lower part of the grate the oxygen of the air unites with the carbon of the fuel to form carbonic acid, CO_2 ; and this gas rising up through red-hot coal or carbon, C , has part of its oxygen abstracted by the carbon, and two molecules of carbonic oxide, CO , are produced, which taking fire on the top of the coals, burn with the characteristic blue flame, abstracting more oxygen from the air, and re-forming carbonic acid, CO_2 . Carbonic oxide can be prepared for experimental purposes by heating in a retort a mixture of oxalic acid, $\text{H}_2\text{C}_2\text{O}_4$, and sulphuric acid, H_2SO_4 , when the latter abstracts the water from the oxalic acid, and the other elements, C_2O_3 , escape as carbonic acid, CO_2 , and carbonic oxide, CO . On passing the mixed gases through a solution of potash, KOH , the carbonic acid is retained as carbonate of potash, K_2CO_3 , whilst the carbonic oxide remains as gas. Carbonic oxide is a transparent, colourless gas, with an oppressive odour. It is rather lighter than air, its specific gravity being only '968. In this it differs very markedly from Carbonic Acid (q.v.). For many years it resisted all attempts to liquefy it, but at last, on December 2, 1877, it yielded to the modern methods of combined cold and pressure. It burns with a blue flame, but is a non-supporter of combustion, and at once extinguishes a lighted candle introduced into it. It is very poisonous, and even when largely diluted with air, if inhaled, it produces a sensation of oppression and tightness of the head, and ultimately acts as a narcotic poison. It enters into many compounds known to the organic chemist, such as urea. It is used in Siemens's and other 'producer' gases, of which it is a principal ingredient; and is the most important reducing agent in blast-furnace processes.

Carboniferous System. The strata included under this system rest upon those belonging to the Devonian and Old Red Sandstone system, and are overlaid by the Permian. The system derives its name from the amount of coal and carbonaceous matter which it contains. It is strongly developed in the British Islands, as in Wales, the midland and northern counties of England, the central lowlands of Scotland, and over a large part of Ireland. The following are the chief divisions of the system recognised in the British area, arranged in descending order:

- | | |
|---|--|
| 1. COAL-MEASURES. | { Red Sandstone Series.
Upper Coal-bearing Series.
Middle Coal-bearing Series.
Lower Coal-bearing Series. |
| 2. MILLSTONE GRIT. | |
| 3. CARBONIFEROUS or MOUNTAIN-LIMESTONE. | { Yoredale Beds.
Main or Scaur Limestone.
Lower Limestone, Shale (England), and
Calcareous Sandstones (Scotland). |

The *Carboniferous Limestone* group is of very variable thickness, is widely distributed throughout the several districts in which the system is developed. In South Wales and the adjacent regions of England it is composed of a lower set of arenaceous and argillaceous strata, 200 to 500 feet thick, and an overlying massive gray or bluish limestone (500 feet thick) which is eminently of marine origin, being crowded with the debris of crinoids, corals, brachiopods, and other forms. Followed northward into the Pennine chain this limestone swells out to a thickness of 4000 feet, and is in that region overlaid by some 2000 feet of sandstones, shales, and limestones (Yoredale Beds). Passing into Northumberland and Scotland, the Carboniferous limestone series takes on quite a different character, the thick limestones of the more southern regions being represented by sandstones and shales, intercalated with which are seams of coal and ironstone, and only occasional beds of limestone. In Scotland the lower half of

the Carboniferous system consists of two well-defined groups—viz. the *Calcareous Sandstones*, and overlying these the *Carboniferous Limestone*. These may be taken as approximately of contemporaneous origin with the Carboniferous limestone series of England. The Calcareous sandstones comprise two groups: the lower or Red Sandstone group consisting chiefly of red, gray or white, and yellow sandstones, with subordinate beds of shale; and the upper (Cement-stone group) including a considerable thickness of white and yellow sandstones, and dark shales with beds of impure cementstones, thin limestone, coal, ironstone, bituminous shale, occasional seams of gypsum, &c. With the lower or Red Sandstone group are associated a most extensive series of volcanic rocks (chiefly andesites, basalt-rocks, and tuffs) which form prominent ranges of high ground that sweep round the borders of the larger basins of Carboniferous strata. The hills that extend from the head-waters of the river Irvine to the shores of the Clyde, the Campsie Hills, the hill-ranges behind Burntisland, &c. in Fife, are examples. The Cement-stone group in the basin of the Firth of Forth is remarkable for its bituminous shales, now so largely worked for the production of mineral oils. Volcanic rocks are likewise associated with this group, but not so extensively as with the older Red Sandstone group. The Scottish Carboniferous limestone consists of a variable thickness of sandstones and dark shales, with which are intercalated seams of coal, fireclay, ironstone, and a few beds of limestone—the thickest of which rarely reaches 100 feet. The whole thickness of this series does not exceed 2700 feet as a maximum. Contemporaneous volcanic rocks occur in the series only in a few places.

In Ireland the Carboniferous system is represented chiefly by strata belonging to the mountain-limestone series. In the south and central areas the Welsh and English type appears—viz. massive limestones underlain by thick shales, &c. Towards the north the Carboniferous limestone series approximates in character to that of the Lower Carboniferous of Scotland. Contemporaneous igneous rocks are associated with the limestone series in various parts of Ireland.

The *Millstone Grit* consists of a series of grits, sandstones, shales, &c., varying in England, from 300 feet up to 5000 feet in thickness. In Scotland the maximum thickness is 900 feet, and in some districts the series is hardly recognised.

The *Coal-measures* comprise a variable thickness of sandstones, and dark shales with seams of coal, fireclay, and ironstone. In South Wales this series attains a thickness of 8000 feet or thereabout; in Lancashire, 6600 feet; in the Midland districts, an average of about 3000 feet; in Northumberland and Durham, 3000 feet; in Scotland the maximum is 2100 feet. In Lancashire and Scotland the coal-bearing strata of this series are overlaid by a set of barren red sandstones.

The changes which the Carboniferous strata undergo as they are followed from England into Scotland show that the sea in which the thick mountain-limestone accumulated shallowed away towards the north; the Lower Carboniferous strata of Scotland pointing to estuarine or brackish and fresh-water conditions, interrupted now and again by longer or shorter spells when these shallow waters gave place to terrestrial conditions. The very subordinate position occupied by the thin limestones in the Scottish series sufficiently demonstrates that the low-lying tracts of Scotland were only occasionally invaded by the sea. Thus it has come to pass that many of the most important coal-seams of Scotland occur on the same geological horizon as the pure marine limestones of England and Ireland.

The Carboniferous system appears in many other parts of the world. In Europe the most notable coal-fields after those of Great Britain are the coal-fields of Liège and Mons (Belgium), and that of Saarbrück in the Rhenish Provinces. Various coal-fields also occur in France (St Étienne, &c.), in Hanover, Westphalia, Saxony, Bohemia, and Silesia. In Russia the strata belong chiefly to the lower part of the system, and are generally unproductive. A considerable coal-field, however, occurs along the northern shores of the Sea of Azov. Carboniferous rocks likewise occur in the Western Alps, but they are generally much altered, and disturbed, and barren. They are also known in the north of Spain, where they yield some coal. In China, coal-bearing strata are extensively developed, but they are worked in a very unscientific manner. Coal of Carboniferous age is worked in Japan, and in Australia there is a considerable coal-field of the same age.

In North America the system attains a great development. The Carboniferous strata here are divided into two groups: the Lower or sub-Carboniferous (corresponding to the Carboniferous limestone of Britain) and the Carboniferous, comprising the millstone grit and the coal-measures. According to Professor Dana, the coal-bearing area of the North American continent is approximately as follows:

	Sq. Miles.
Rhode Island area.....	500
Alleghany area.....	59,000
Michigan area.....	6,700
Illinois, Indiana, West Kentucky.....	47,000
Missouri, Iowa, Kansas, Arkansas, Texas.....	78,000
Nova Scotia and New Brunswick.....	18,000

It is worthy of note that Carboniferous strata have likewise been detected in the Arctic regions, as in Melville Island, the northern coast-lands of Baffin Bay, in Bear Island, and Spitzbergen.

Economic Products.—The most important of these are of course the coals, ironstones, and limestones. The individual coal-seams vary in thickness from less than an inch up to many feet or even yards; these last, however, consist generally of several seams which have come together, owing to the thinning-out of the beds that separate them elsewhere. The total thickness of workable coal naturally varies in the different coal-fields—in some of which we may have a greater thickness of strata or a larger number of seams. In South Wales—the largest coal-field in Britain—the total thickness of coal exceeds 200 feet; in Lancashire the workable coals give an aggregate of 100 feet; in Northumberland and Durham the aggregate is 47 feet; in Lanarkshire the united thickness of workable coal-seams (true coal-measures) varies from 30 to 70 feet or more, and 15 feet in the limestone series; in Midlothian there is an aggregate in the coal-measures proper of 43 feet, and in the limestone series of 68 feet. The coals vary much in character (see COAL), some being used for ordinary household purposes, others for steam, &c., others for the production of gas, mineral oil, &c. In the American coal-measures (with a maximum thickness of 3000 feet) the maximum of included coal is 120 feet. In Britain the bedded iron ores are principally clay-ironstones, and the carbonaceous variety called blackband (see IRON ORES). Hematite also occurs as very large masses in the thick limestones (Cumberland and Northumberland). Ores of zinc, lead, and antimony are likewise met with in the limestones, as in Derbyshire, Cumberland, Yorkshire, Wales, &c. The fireclays are largely worked in many places for the manufacture of bricks, &c. The sandstones likewise are held in great repute for building purposes, some, however, being much more durable than others. The thin-bedded varieties again are largely used for flags or paving-stones.

Other kinds of sandstones are employed for millstones, grindstones, crushers, &c., and some of the harder kinds for road-metal. The limestones are in extensive request for mortar, cement, agricultural purposes, &c., some of the black and coloured or highly fossiliferous varieties being in considerable demand for ornamental mason-work. Amongst the shales the bituminous kinds are the most important, but from others sulphur and sulphuric acid are extracted, while some are employed in the preparation of alum and sulphate of iron. Locally certain minerals occur in sufficient quantity to be of economic importance, such, for example, as *fluor-spar*, used for ornamental purposes, and *Baryta* (q.v.), or heavy-spar.

Life of the Period.—Among the most characteristic and abundant fossils are, as might have been expected, the plants. Among the most abundant types were Pteridosperms, seed-bearing plants, represented now and again by stems, but chiefly by their fern-like foliage, which were long believed to be true ferns, such as *Sphenopteris*, *Pecopteris*, *Neuropteris*, &c. Tree-ferns, however, did occur, and are known by their stems, such as *Calopteris*. Besides these there were great lycopodiaceous trees such as *Lepidodendron* (q.v.), tall Equisetaceæ such as *Calamites* (q.v.), and the remarkable sigillarioid trees, as to the affinities of which there is still doubt (see SIGILLARIA). Another characteristic tree is *Cordaites*, which has relations both to cycads and conifers. Large coniferous trees (*Arancarioxylon*) are also met with now and again. The contemporaneous land-fauna has left but few traces. Here and there, however, specimens of true air-breathers are met with. Amongst these are amphibians, such as *Archegosaurus* (q.v.), millepedes, and insects of various kinds, such as extinct forms of May-flies, cockroaches, crickets, locusts, &c., and others which cannot with certainty be referred to any existing type, for they seem to have affinities with various widely separated modern forms. Scorpions abounded, and these ancient forms closely approximate in character to the living type. Land-snails have also been found, not differing much apparently from the living *Pupa*. The fauna of the seas and lagoons is much better represented than that of the land. The minute foraminifera swarmed in places—their shells occasionally forming beds of limestone. Corals were likewise extremely abundant, their remains crowding many of the limestones. Common forms are *Lithostrotion*, *Clisiphyllum*, *Zaphrentis*, *Favosites*, &c. Other great limestone-formers were the crinoids (such as *Platycrinus*, &c.), the columns and detached plates of which are among the most abundant fossils in the limestones and calcareous shales of the system. The peculiar armless blastoids, *Pentremites*, are likewise characteristic Carboniferous fossils. Crustaceans were represented by a few *Trilobites* (q.v.), the last survivors of that great family, and by ancestral forms of our ostracods, phyllopods, and king-crabs, as well as by the extinct group of eurypterids. Polyzoa, such as *Fenestella*, are very common, as are also brachiopods; among the more frequently occurring forms being *Productus*, *Spirifer*, *Terebratula* (q.v.), &c. *Lamellibranchs* are fairly represented, especially by the *Aviculoid* group—some of the forms having apparently frequented estuaries or lagoons. *Gasteropods* and *pteropods* also occur, and are locally abundant, but they are not so common fossils as the brachiopods. *Cephalopods* are not infrequent, especially *Orthoceras* (q.v.), of which over 150 species are known from this system. Other notable forms are *Nautilus* (q.v.) and *Goniatites* (q.v.). Fishes are tolerably common. They come under the two groups of *Ganoids* and *Placoids*. The former are represented

by such forms as *Rhizodus* and *Megalichthys*; and the latter by numerous large and often finely sculptured fin-spines, and hard palatal crushing teeth. These large sharks preyed upon the smaller ganoids, whose teeth and scales are common in the *Coprolites* (q.v.), or fossil droppings of the former.

Carborundum, an abrasive material produced by fusing sand and coke (mixed with sawdust and salt) in the intense heat of the incandescent electric furnace. The product is a mass of bright blue crystals, nearly as hard as diamond, and more satisfactory than corundum for various kinds of work.

Carbuncle (Lat. *carbunculus*, 'a little coal'), a beautiful deep-red mineral called *Pyrope* (q.v.) by mineralogists. The carbuncle of the ancients was probably the deep-red variety of noble garnet. The mythical carbuncle laid by a goldfinch rendered its bearer invisible.

Carbuncle (so called from the redness and the burning pain), an inflammation more severe than an ordinary Boil (q.v.), is caused by some vitiated condition of the blood, or some atmospheric influence, attacking a patch of skin on the shoulders, nape of the neck, or indeed on any part of the body. The part swells slightly, feels hard, and this hardness extends deeply into the tissues; the pain is very severe, and the patient much depressed with loss of appetite, and general derangement of the secretions. As the disease advances, the redness assumes a dark purple or livid hue, the cuticle rises in blisters, and many small specks of matter appear on its surface, which discharge, and leave apertures like those in the rose of a watering-pot; through this a viscid purulent fluid escapes, and after some time the small sloughs or cores of the true skin which have been killed by the disease. In some cases the apertures meet, forming large openings, and in others the whole patch of skin sloughs and comes away.

The treatment of carbuncles consists in restoring the secreting organs to a healthy condition, the agents for which must depend on the individual case; in supporting the patient's strength by easily digested food, wine, soups, and tonics; relieving pain by opiates, and encouraging suppuration with warm poultices. Sulphide of calcium in small doses is sometimes useful in arresting the disease. Free incision is practised when the carbuncle has definitely formed, to allow the escape of the dead material; and the interior is often swabbed with pure carbolic acid. Occasionally the presence of a carbuncle is due not merely to a debilitated state of health, but to some serious constitutional disease, like diabetes. For this careful medical examination and special treatment are necessary.

Carburet. See CARBIDES, CARBON.

Carburetted Gas is used for lighting purposes. Water-gas is passed over heated hydrocarbon material. Benzene and other volatile substances mix with the water-gas, forming the mixture known as carburetted gas.

Carburetted Hydrogen is a term formerly applied to several compounds of carbon and hydrogen. For light carburetted or mono-carburetted hydrogen, CH_4 (marsh gas or fire-damp), the principal constituent of coal-gas, see GAS, METHYL. For heavy carburetted or bi-carburetted hydrogen, C_2H_4 , see OLEFIANT GAS.

Carburettor. See GAS-ENGINE, MOTOR-CAR.

Carcagente, a town of Spain, 25 miles SSW. of Valencia by rail, on a rich plain near the right bank of the Júcar. The plain is a vast rice-field, cut up by innumerable canals. Pop. 15,000.

Carcassonne (the *Carcaso* of Cæsar), a town in the French department of Aude, on the river

Aude, and the Canal du Midi, 56 miles SE. of Toulouse by rail. It is divided by the river into two parts, the old and the new town, which are connected by two bridges dating from 1184 and 1846. The new town is well and regularly built; but the old town or *cit  *, built on a height, is much more picturesque, with its ramparts and towers, some parts of them dating from the time of the Visigoths, and the rest, with the many-towered castle, from the 11th or 13th century. In 1210 this old town suffered greatly at the hands of the fierce bigot Simon de Montfort and his crusaders, who here burned 400 of the Albigenses. In 1356 it effectually resisted the Black Prince. Of several fine churches the finest is St Nazaire. Cloth-making is the staple industry; and there are also manufactures of paper, leather, linen, and soap. Pop. 30,000. See books by Viollet-le-Duc (1858) and by Boyer (1884).

Carcharias. See SHARK.

Carcharodon, an extinct genus of sharks, the large conical and sharply notched or saw-edged teeth of which are not uncommon fossils in the Tertiary deposits. Teeth of the same character were dredged in considerable numbers by the *Challenger* expedition from great depths. See SHARK.

Car'chemish, an ancient city on the Upper Euphrates, NE. of the modern Aleppo, was long the southern capital of the Hittites (q.v.), and was a city of great size and importance. It was identified by Mr George Smith with Jerabl  s or Jerabis, and has been excavated since 1911.

Carcinoma. See CANCER.

Cardamine. See CRESS.

Cardamoms are the capsules of certain species of Zingiberace   (q.v.), particularly *Elettaria Cardamomum*, a flag-like perennial, abundant in the moist shady mountain forests of the Malabar coast, where they are largely cultivated on small clearings. The three-celled capsules contain numerous wrinkled seeds, which form an aromatic pungent spice, weaker than pepper, and with a peculiar but agreeable taste. On account of their cordial and stimulant properties they are employed in medicine, very generally to qualify other medicines; they are also used in confectionery, although not to a great extent in Britain; but in Asia they are a favourite condiment; and in Russia, Scandinavia, and Northern Germany they are used in almost every household to flavour pastry. Other plants belonging to the same order yield drugs employed under the same name, but all are of inferior value; thus *Amomum Cardamomum* of Siam, &c. yields Round Cardamoms, *A. xanthoides* Wild or Bastard Cardamom, &c.

Cardan, JEROME (Ital. Girolamo Cardano, Latinised Hieronymus Cardanus), a celebrated sixteenth-century Italian mathematician, naturalist, physician, and philosopher, was born at Pavia, September 24, 1501, the natural son of a jurist of Milan. His education was as irregular as his birth, but he finally completed his studies at the universities of Pavia and Padua, graduating in medicine at the latter. He became professor of Mathematics at Milan, at the same time practising medicine, and though at first obscure and poor, gradually gained a high reputation. In 1552 he visited Scotland, on an invitation from Archbishop Hamilton, and managed to cure the primate of an inveterate asthma, which had defied the skill of the most celebrated physicians. In 1559 he became professor of Medicine at Pavia, later at Bologna, where he continued teaching till 1570, when we find him in prison for heresy or debt, or both. Having regained his liberty in 1571, he

went to Rome, where he was speedily admitted a member of the medical college, and pensioned by Pope Gregory XII. The rest of his life he spent, without public employment, in Rome, where he died September 2, 1576, a few weeks after finishing his remarkably candid and interesting autobiography, *De Propria Vita*. Some writers have asserted, but on no sufficient authority, that he starved himself to death, to fulfil a prediction which he had made as to the time when he should die. He was a devoted astrologer, and cast horoscopes for himself and others, while he believed himself one of the five or six celebrated men who had, like Socrates, a familiar demon. Cardan was one of the most remarkable men of his age, and reveals throughout his works an intellect of rare subtlety and force, with a really sound conception of scientific method in spite of all the empiricism and imperfection of his knowledge. He too often spends his strength in merely futile attempts at explanations of natural phenomena for which the necessary data were not to be collected for centuries later; but he occasionally lets fall hints of scientific principles so profound, looked at in the light of after-years, that he himself cannot at all have even guessed at their significance. A summary of his notions on physics and metaphysics is given in his two works—*De Subtilitate Rerum*, in 21 books, and *De Rerum Varietate*, in 17 books. He wrote more than a hundred treatises on physics, mathematics, astronomy, astrology, rhetoric, history, ethics, dialectics, natural history, music, and medicine. A formula for the solution of certain kinds of cubic equations is called 'Cardan's formula,' and was published by him, as his own invention, in the *Ars Magna sive de Regulis Algebraicis* (1545); but it would appear that the formula was really the invention of Nicolo Tartaglia. His numerous writings were collected and edited by Charles Spon (10 vols. Lyons, 1663). See *Lives* by Henry Morley (2 vols. 1854) and W. G. Waters (1898).

Cardboard, or **CARD**, is made by pasting together several layers of paper, according to the thickness and quality required, the outside sheets being generally white. *Bristol-board*, used by artists for pen-and-ink drawings, and many other purposes, is made in a similar manner, but of a very much finer quality of paper, and has a beautifully finished surface. According to the number of layers, they are called *three*, *four*, *six*, or *eight* sheet boards. See **MILLBOARD**, **STRAWBOARD**.

Cardenas, a seaport of Cuba, on the north coast, 75 miles E. of Havana, with which it is connected by rail. It has a good harbour, and exports sugar. Pop. 33,000, mostly whites.

Cardi. See **CIGOLI**.

Cardia (Gr.), the heart; also the upper orifice of the stomach, called, on account of its vicinity to the heart, by the same Greek name.—**CARDIALGIA** is the name commonly applied to the particular variety of pain called *heartburn*, arising from a disordered stomach, and accompanied by acid eructations. See **INDIGESTION**.

Cardiaceæ. See **COCKLE**.

Cardiff (*Caer-Taff*, 'fort of the Taff'), a parliamentary, municipal, and county borough, city with Lord Mayor (1905), and seaport, the county town of Glamorgan, South Wales, situated on the river Taff, about a mile from its mouth in the Bristol Channel. The largest town and chief seaport of Wales, in recent years it has made remarkable progress. The population rose from 2000 in 1801 to 10,077 in 1841, 56,911 in 1871, 128,849 in 1891, 182,259 in 1911, and 200,262 in 1921. Only a small percentage of these speak Welsh. Cardiff, with

the urban district of Penarth, returns three members to parliament. The city's parks cover 350 acres, the largest being Roath (166 acres). Cathays Park (60 acres), specially reserved for public buildings, contains a group of strikingly handsome edifices, all erected in the 20th century, including the City Hall, in Renaissance style; Glamorgan County Hall; Assize Courts; the University College of South Wales and Monmouthshire (first established 1883), the largest of the four constituent colleges of the University of Wales, the Registry of which is also in Cathays Park; the National Museum of Wales; and the Technical Institute. Among corporation undertakings are the water-works, electric lighting and tramways, baths, markets, abattoirs, central and branch libraries.

The port of Cardiff is the outlet for the large mineral and manufactured produce of the central portion of the South Wales mineral-field, in which are the populous districts of Merthyr-Tydvil, Rhymney, Aberdare, and the Rhondda Valley, with which this port is connected by the Taff Vale, the Rhymney, the Barry, and the Ely Valley Railways, and the Glamorganshire Canal. The port, which includes the harbours and docks of Penarth and Barry, now boasts the highest tonnage of shipping cleared at any port in the kingdom, and is the premier coal-exporting city in the world. Owing to less abundant imports, Cardiff's total shipping, entered and cleared, is surpassed by London and Liverpool. In 1912 the tonnage cleared was 9,163,115 (exclusive of coasting trade); the total exports were valued at £13,913,682, including 17,822,467 tons of coal, worth over £13,187,000—ten times the quantity exported in 1860. The growth of Cardiff began with the opening (1794) of the canal from Merthyr-Tydvil to the sea. The Bute Docks, with an area of 163 acres, constructed at the expense of the Bute estate, have cost nearly six millions sterling, and with the Glamorganshire Canal are now vested in the Cardiff Railway Company. They consist of five docks. The first, or West Bute Dock, was completed in 1839. The second, or East Dock, dates from 1854. The Roath basin followed twenty years later, and the Roath Dock in 1887. The latest, Queen Alexandra Dock, opened in 1907, has an area of over 50 acres, and is capable of taking in the largest vessels afloat. There are powerful cranes and staiths on the quays of the docks, with machinery by which the breaking of the coal is almost entirely prevented. Some of the staiths are capable of shipping 340 tons of coal per hour. There are also a tidal harbour and a low-water pier 1400 feet in length. The Penarth Docks, about one mile to the westward, form another outlet for the trade of the district. The Barry Docks (1888), of about 114 acres, add enormously to the shipping facilities of Cardiff. The imports to Cardiff include iron ore, timber (pit-props), cattle, frozen meat, foreign fruit and vegetables, corn and flour, &c. Cardiff has ironfoundries and tinplate-works; and iron and steel rank next to coal in her export tables. Shipbuilding is also a leading industry. Cardiff is on the Great Western Railway system, about 170 miles W. of London.

The ancient city of Llandaff (q.v.), now a mere village, is almost connected with Cardiff. Cardiff Castle, built in the 11th century, is partly now in ruins. The third Marquis of Bute, to whom nearly the whole of the modern town belonged, spent large sums in rebuilding the castle, using parts of it as a private residence. Robert, Duke of Normandy, brother of Henry I., died in the castle after twenty-eight years' captivity. Cromwell (1648) got possession of the castle through treachery, after bombarding it three days; and he afterwards hanged the traitor, as an example to his own

soldiery. The town was an important one, under Britons, Romans, and Normans in succession.

Cardigan (anciently *Aberteifi*, 'mouth of the Teifi'), the county town of Cardiganshire, a municipal borough and seaport on the right bank of the Teifi, 3 miles from its mouth, and 117 miles NW. of Cardiff by rail; the population is about 3500. With Aberystwyth, Lampeter, and Adpar, Cardigan till 1885 returned one member to parliament. Remains of a castle crown a low cliff on the Teifi, which is supposed to have been founded in 1160 by a Norman baron. The town suffered much in the struggles between the Welsh and the Normans. The Teifi is said to have been the last British resort of the beaver.

Cardigan, JAMES THOMAS BRUDENELL, seventh EARL OF, born in 1797, sat in the House of Commons from 1818 to 1837, when he succeeded his father. He entered the army in 1824, and rapidly bought himself into the command of the 15th Hussars, which he resigned in 1833, on the acquittal of an officer whom he had illegally put under arrest. From 1836 to 1847 he commanded the 11th Hussars, on which he spent £10,000 a year, and which he made the smartest cavalry regiment in the service. He never was in any degree popular with his officers, and his treatment of them brought about a duel with Captain Harvey Tuckett, for which in 1841 Cardigan was tried before the House of Lords, but escaped through a legal quibble. He commanded a cavalry brigade under Lord Lucan in the Crimea, and led the famous charge of the Six Hundred at Balaclava. He was inspector-general of cavalry 1855-60, and died 28th March 1868.

Cardigan Bay is a semicircular bend of St George's Channel, on the west coast of Wales, 54 miles wide from north to south, and 35 miles deep, with a sweep of coast of 130 miles. It has 3 to 30 fathoms water, with three reefs. A strong current sweeps round the bay from south to north. Almost all the harbours on the coast are obstructed by bars.

Cardiganshire, a maritime county in South Wales, on Cardigan Bay, with a crescent-shaped coast-line of 48 miles, a maximum width of 32 miles, and an area of 693 sq. m. The surface is hilly, interspersed with fertile valleys. On the Montgomeryshire border is Plinlimmon (2469 feet); and a rugged, bleak range of hills runs through the middle of the county from the south-west to the north-east, between the coast and the Teifi, ending abruptly in a shelving beach in the middle of the coast; but on other parts there are rich flat tracts. The county does not contain much wood. The chief rivers are the Teifi, which rises in a small lake near the centre of the county, and runs 70 miles south-east and east along the southern border, the Aeron, Claerwen, Ystwith, and Rheidol. The 'sweet shire of Cardigan' contains some romantic waterfalls, especially the Rheidol Falls and the Devil's Bridge, and above twenty small lakes or llyns, noted for their wild beauty. It reposes on Lower Silurian slates and shales, containing few or no organic remains. Rich veins of copper, lead, zinc, and silver occur. Cardiganshire is an agricultural county, two-thirds of its total area being cultivated; and the rearing of live-stock is a leading industry. There are some manufactures of coarse woollens and gloves, stockings and hats. Cardigan is the county town, the other chief towns being Aberystwyth, Lampeter, New Quay, Aberayron, Tregaron. Cardiganshire sends one member to parliament. Pop. (1801) 42,956; (1861) 72,245; (1881) 70,270; (1911) 59,879; (1921) 61,292. The county has many remains of British and Roman camps and roads, stone circles, cairns, and castles.

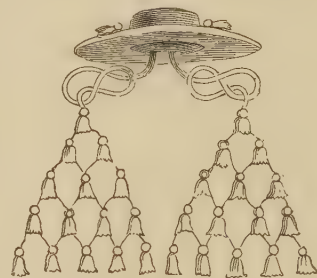
Many Welsh princes and bards were buried in the abbey of Strata Florida, 16 miles SE. of Aberystwyth, and some of the records of the principality were kept here. The women still wear the Welsh costume; and besides a survival of 'bride-capture,' there is a curious custom of sending 'biddings' or presents to a newly-married couple, which, when sold, often realise £50. In 1843-44 Cardiganshire was disturbed by the Rebecca riots. See Meyrick's *History of Cardiganshire* (1810).

Cardinal. The word was first used of any cleric regularly settled (*incardinatus*, 'inhinged') in any church, then from the 8th century of the clergy in the cathedral, the bishop being regarded as the *cardo* or 'hinge' of the diocese. Next, the forged decretals (see CANON LAW) speak of the pope as the *cardo* or 'hinge' of the whole church, and Leo IX. claims a high and singular position for the clergy of the Roman Church; but not till the time of Pius V. was the title formally restricted to its modern use, according to which it signifies the counsellors of the pope who, next to him, hold the highest dignity in the church over which he rules.

The present college of cardinals has arisen (1) from the deacons who from early times assisted the Bishop of Rome, and who were originally seven in number; (2) from the presbyters who remained in the chief church, or administered *tituli*—i.e. subordinate churches erected as need arose in the city; (3) from bishops who resided in the Roman diocese and helped the bishop proper. The *Liber Pontificalis* makes mention of such assistant-bishops in Stephen IV.'s pontificate (768-72).

After many fluctuations, the number of cardinal bishops was fixed by Sixtus V. at six, of cardinal priests at fifty, of cardinal deacons at fourteen. When Benedict XV. died in 1922, the Sacred College had 61 members, 9 short of the *plenum*, which is hardly ever reached: 30 Italian, 7 Spanish, 5 French, 5 German and Austrian, 2 American, 2 English, 2 Polish, and 1 each from Ireland, Belgium, Canada, Brazil, Holland, Hungary, Portugal, and Czechoslovakia.

The appointment (*creatio*) of cardinals rests with the pope, who generally consults the existing cardinals, and often receives proposals from secular governments. The same qualifications of age, learning, character, &c., are required in the case of a cardinal and of a bishop. The cardinals in Conclave (q.v.) elect the new pope, have constant access to him, and form his chief council. They have a vote at general councils, and since the 13th century, precedence over all other members. They have quasi-episcopal jurisdiction within the churches from which they take their titles. They have had since Urban VIII. the title of 'Eminence.' The body of cardinals is called the Sacred College. Their insignia are the red cardinal's hat which is given them by the pope, and not worn, but suspended in the church of their title, and placed on the bier at death; the red *biretta*, the sapphire ring, the mitre of white silk, the purple cassock, &c. Cardinals, however, who belong to a religious order, retain the colour proper to it in their cassocks. If a cardinal holds an episcopal see, he must reside there; otherwise he must not leave Rome without permission. At the head of the college of cardinals



Cardinal's Hat.

stands the dean, who is usually Bishop of Ostia and senior of the cardinal bishops. It is he who consecrates the newly-elected pope, if not already a bishop. We must add that the chief affairs of the Roman Catholic Church are in the hands of the cardinals not as such, but as the chief members of the Roman (administrative) congregation. But the cardinals possess no constitutional rights under the absolute government of the papacy. They cannot even meet together without the pope's leave. From Pole's death (1558) there was no resident English cardinal till Wiseman's time (1850); in the United States the first cardinal was McCloskey (1875).

Cardinal Bird, or **RED BIRD** (*Cardinalis virginianus*), also called Cardinal Finch, Cardinal



Cardinal Finch
(*Cardinalis virginianus*).

Grosbeak, and Virginian Nightingale, one of the finest song-birds of America, belongs to the family of finches or Fringillidae, and differs from the true grosbeaks (Coccothraustes) in having the beak slightly bulging. The general colour of the male is red, the head being vermillion, and only a small portion of the plumage around the base of the bill and on the upper throat being black. The

feathers of the crown are long, and erected into a conical crest, like a red cap. The female is fallow brown above, and yellowish brown below. The cardinal abounds in Texas, Florida, and the southern states of America generally, migrating northwards in spring, but never farther than Massachusetts, where only a few stragglers are seen. Its loud, clear, sweet, and varied song is to be heard chiefly in the mornings and evenings. In size it exceeds any of the British Fringillide, being about equal to the starling.

Cardinal Flower. See LOBELIA.

Cardinal Points. See COMPASS (MARINERS').

Cardinal Virtues (Lat. *cardinalis*, 'chief,' from *cardo*, 'a hinge'). The cardinal virtues of the ancients were Justice, Prudence, Temperance, Fortitude; and were so called because the whole of human virtue was supposed to hinge or turn upon them. This mode of dividing the virtues is to be found as far back as Socrates, and these were regarded by the Catholic Church as the *moral*, in distinction from the *theological* virtues (Faith, Hope, Charity). But this classification into cardinal virtues is manifestly somewhat arbitrary; Whewell pointed out, for example, that it wholly omits the fundamental virtue of Benevolence. See ETHICS, SEVEN.

Carding is the process of disentangling and arranging in parallel rows the fibres of cotton or the like in order to spinning. See SPINNING.

Cardinia, a genus of fossil Lamellibranchs (q.v.).

Cardioid (i.e. 'heart-shaped,' from Gr. *kardia*, 'heart'), a curve generated by a point on the circumference of a circle which rolls upon an equal circle. If the diameters each equal a , its polar equation is

$r = a(1 + \cos \theta)$. It meets the fixed circle in a cusp, and is elsewhere external to it. It is a particular case of the limaçon, which may be defined as a curve traced by a point, at a fixed distance from the circumference of a circle, on a radius vector to the circle from a fixed point on the circumference. Its equation is $r = a + b \cos \theta$, where a is the fixed distance and b the diameter of the circle. Obviously, if $b = a$ the limaçon is a cardioid.

Cardium. See COCKLE.

Cardona, a town of Spain, 44 miles NW. of Barcelona, on the Cardoner, with a strongly fortified castle. Close by is a celebrated mountain of salt, which has a height of about 265 feet, and measures a league round; its caves are frequently visited by parties with torches to witness its singular and beautiful reflection of the light. Pop. 4000.

Cardoon (*Cynara Cardunculus*), a perennial composite of the same genus with the Artichoke (q.v.), a native of the south of Europe and the north of Africa. It much resembles the artichoke, but is of larger size, whilst the flower-heads are smaller. It has long been in cultivation, particularly on the Continent, for the sake of the blanched leaf-stalks and midribs, which are used as a salad, or more generally as a boiled vegetable during winter.

Cardross, a village of south Dumbartonshire, on the Firth of Clyde, $3\frac{1}{2}$ miles WNW. of Dumbarton by rail. King Robert Bruce died at Cardross Castle (1329), which stood between the village and Dumbarton. The suspension of the Free Church minister in 1858 led to a famous law-suit in the Court of Session.

Cards. The positive history of playing-cards commences about five hundred years back. Many theories and assertions have been hazarded as to the earlier history and origin of cards; but with regard to all of them the verdict of 'not proven' must be returned. The three chief opinions which have been held as to the origin of cards are: (1) That they had their birth in the East, and were thence transported to Europe. (2) That though there is evidence pointing to the use of playing-cards in India and China at a remote period, the appearance of cards in Europe is due to an original invention and not to importation. (3) That there is no satisfactory evidence to show that the origin of cards was other than European.

The first opinion can claim only the respect due to antiquity. It is asserted that the Arabs, Saracens, or Moors introduced cards into Europe by way of Spain. Covelluzzo (end of 15th century) states that cards were first known in Viterbo in 1379, whence they came from the country of the Saracens; but he merely chronicles an opinion prevalent in Viterbo a century later than the time of which he speaks. Bussi, the historian, who quotes Covelluzzo, states that he was rather a credulous person. Further, cards being originally called *naibi* in Europe, and the Hebrew and Arabic words, *nabi*, *naba*, *naban*, conveying the idea of prophecy, it is said that the name is derived from the Arabic, and that cards were first used for the purpose of divination. But no Arabic manuscript gives the meaning of playing-cards to the word *nabi*. Dr Willshire (*Catalogue of Playing Cards in the British Museum*, 1877) says that 'the theories in support of the connection of cards with early eastern occult philosophy and thaumaturgy are of too recondite and shadowy a character to admit of satisfactory argument.'

The Indian theory is based on a supposed resemblance between chess and cards, chess being probably of Hindu origin; and on the similarities between certain Indian and European cards and games. But the differences between chess and cards are much more notable than their resemblances.

Modern critics are of opinion that India has imitated the games of Europe, for the peculiarities which link eastern and western card games existed in the latter at least as early as 1488; and Europe had no continuous intercourse with India prior to 1494. Taylor's theory that cards made their way into Europe by means of the Gypsies is dismissed by Dr Willshire with the remark that 'whether the Zingari be of Egyptian or Indian origin, they did not appear in Europe before 1417, when cards had been known for some time.' See, however, the article GYPSIES.

If cards really had an early and separate origin in China, so had gunpowder, printing, and engraving. At all events the latest authorities reject the notion that cards were imported from China into Europe.

Hence it may be safely said that it is very doubtful whether the origin of playing-cards should be looked for in the East. Assuming, as most probable, that cards appeared independently in Europe about 1350, it has to be decided in what part of Europe they were first known. The majority of those who maintain the European origin of cards assign them to Italy. Dr Willshire gives a 'decided inclination' to Italy and to Venice, as that particular district which so modified them by changes connected with the emblematic series, and the addition to it of a numeral sequence, as to acquire a right of parentage in respect of modern playing-cards, not readily to be set aside. A Swiss monk, Johannes, in a MS. dated 1377 now in the British Museum, says the *ludus cartarum* came to Switzerland that very year. In the registers of the *Chambre des Comptes* of Charles VI. of France, under February 1392, is the item, '*Donné à Jacquemin Gringonneur peintre pour trois jeux de cartes à or et diverses couleurs, ornés de plusieurs devises, pour porter devers le Seigneur Roi pour son ebatement LVI. sols Parisis.*' This date (1392) has never been contested. It will be observed that the payment is made for painting, not for inventing cards; hence it is concluded that cards were already known.

Prior to the invention of playing-cards, there existed a series of emblematic pictures, which it is supposed were used for the purposes of divination and sortilege. And it is conjectured that about the middle of the 14th century some inventive genius added a series of numeral cards to the emblematic ones, and so converted them into implements of play. The designs on these combined packs, or *tarots* (so called probably because they were *tarotée* on the back—i.e. marked with plain or dotted lines crossing diagonally), were in the one series emblematic of conditions of life and of human vicissitudes (numbered also with Roman numerals in a margin above the design), and were, in the other series, similar to those now in use. The Venetian pack in the beginning of the 15th century consisted of seventy-eight cards, twenty-two emblematic, and fifty-six numerals, divided into four suits of fourteen cards each—viz. four *coat* (or court) cards, king, queen, chevalier, and valet, and ten *point* (or pip) cards numbered from one to ten. The name *atutti* (*atouts*, or trumps) was given to the emblematic cards, because they were superior to the others. The game played with these cards was called *tarocchi*.

Soon after the first quarter of the 15th century cards spread rapidly all over Europe. As cards travelled, the pack underwent a variety of modifications, and the emblematic series gradually dropped out of use, though games with *tarot* cards are still played in some parts of southern Europe. No Spanish *tarots* are known to exist. In the first instance, a pack of fifty-two numerals appears to have been used in Spain, the queens being sup-

pressed. The French similarly removed a card from each suit, but they retained the queen and abolished the chevalier. The early German numeral cards were the same as the French; but afterwards the queen was displaced, and a superior knave (Obermann) was introduced instead. England appears to have been content to adopt foreign cards as she found them, either Spanish or French, about the middle of the 15th century.

The suits of numeral cards have always been four, but the signs or marks of the suits have differed among various nations. The earliest signs were cups, money, clubs (batons), and swords. These marks are still retained in *tarot* cards and in Italian and Spanish numerals. The Germans early employed hearts, bells, leaves, and glands (acorns). During the second quarter of the 15th century, the French adopted the signs of spades (*pique*), hearts, clubs (*trèfle*), and diamonds.

The origin of the marks of the suits and their meaning has been the subject of much speculation. It is said that they were originally emblematic, cups representing Faith; money, Charity; swords, Justice; and clubs, Fortitude. A good deal of ingenuity has been expended in explaining the meaning of modern signs; but, on the whole, it seems probable they were merely chosen as being well known and easily recognised. The symbol called in England spade, is evidently the German *grün* (leaf of the wild plum), with the Italian name (*spade*) of the corresponding suit (swords). Why the French, from whom we received it, called it *pique* is not known. The English club closely resembles the German acorn (*eichel*). The French formed it like a trefoil and called it *trèfle*; when we borrowed it, we gave the suit an Anglicised Italian name, clubs (*bastoni*). The German heart survives in French and English cards, and requires no explanation. It corresponds to the Italian and Spanish suit of cups. How money (Italian and Spanish) or bells (German) became transmitted into the French *carreaux* and the English diamonds is not known. The circular symbol has become a square one, possibly from a mere love of change.

Beyond occasional alterations in the devices on the cards, the fifty-two card pack has remained much the same as it now is ever since the middle of the 15th century. But numerous improvements have taken place in the manufacture of cards, which comprises many interesting processes. Of these a brief notice is appended.

The cardboard employed is generally formed of several sheets of paper pasted together. Usually the sheet which is to form the front surface is first printed with the court cards and pips; in former days stencil-plates were used for printing the fronts. The printed sheets are then interleaved with plain ones, and the requisite number are joined together with strong paste, to form boards. The boards are then subjected to high pressure in a hydraulic press, and are afterwards dried, flattened, and rolled, preparatory to receiving a coat of colour on the back. The colour is usually formed of tinted enamel. After enamelling, the boards are once more rolled under high pressure to prepare them for the printing on the back.

The ornamentation of the backs of playing-cards requires great skill, especially in the case of the more elaborate designs, which take seven, eight, or even more printings, each of which has to be accurately registered. Numerous designs by the late Owen Jones have thus been reproduced on the backs of cards by Messrs De La Rue & Co., the well-known London manufacturers. Generally, however, the cards used in clubs have their backs plain white or red. After printing, the boards must be once more pressed and polished. They are then cut up into separate cards. Each

card is then subjected to a very careful examination, all defective or marked cards being rejected. Those which pass the ordeal are formed into packs, and the packs have finally to be made ready for sale, and sealed with a stamped wrapper. The packs are variously named, according to their degree of excellence; the best are called Moguls; the second quality, Harrys; the inferior ones, Highlanders, Andrews, and Harlequins. Recently very elaborate machinery has been introduced for rounding off the corners.

It has also become the fashion to place small index pips at the corners of the cards, to indicate their value without feathering them out to any great extent. The indicator system was invented by the late Dr Normandy, and was first brought out in 1860. Another improvement was that of double-headed court cards, which enables players to read the kings, queens, and knaves, whichever way they may happen to be held up. Though a great number of the technical terms used by the workpeople engaged in the manufacture of cards are of French origin, it is not in evidence that the home manufacture can be traced back to the French.

In Russia the manufacture of playing-cards was a government monopoly, and was carried on at the imperial factory in Petrograd, where an enormous number of packs were produced. In England the manufacture has attained considerable magnitude, and the consumption is on the increase. In 1861, the last year of the shilling duty, 290,660 packs were sealed. In 1862, mostly at a shilling, but a small part at threepence, about 160,000 more packs were sealed. In 1863, the duty being threepence, 732,960 packs were sealed. After 1867 the number rose to 737,120, then to 813,920; and in 1873 it exceeded a million. In 1878 duty was paid on 1,115,200 packs of home manufacture, to which must be added large numbers exported which pay no duty; in 1902, on 1,785,840. In 1912-13 duty was paid on over 3,000,000 packs, about 500,000 being imported. In the United States the manufacture has attained enormous proportions.

A duty was first imposed on playing-cards in England in 1615. The amount was five shillings per gross of packs. In the reign of Charles I. this duty was complained of by the Commons as being arbitrary and illegal, and levied without the consent of parliament. In the reign of Queen Anne (1710) an act was passed to obtain a fund 'for carrying on the war and other her Majesty's occasions,' in which it was enacted that cards should pay a duty of sixpence a pack for a term of thirty-two years. Frauds having been discovered, it was made felony, punishable with death, in a subsequent amended act, to counterfeit or forge the seals, stamps, or marks which denoted the payment of the duties. In 1719 (George I.) further provisions for preventing fraud were passed, and the term of thirty-two years was extended indefinitely. In 1756 (George II.) an additional tax of sixpence a pack was imposed, and further measures were framed to prevent fraudulent evasions. Eleven years later the duty was raised to one and sixpence a pack. In 1789, and again in 1801, the duty was further increased, by sixpenny steps, to half a crown a pack. In 1828 the half-crown duty was reduced to a shilling. In 1862 the duty was reduced to threepence in hopes of suppressing the enormous evasion of the duty which notoriously prevailed, and for other reasons. It is believed that now there is no evasion; and the amount realised greatly exceeds that collected under the shilling tax. Since 1909 the duty has been treated as an excise, not a stamp-duty. Imported cards pay a customs duty of 3s. 9d. per dozen packs. Excise receipts mount steadily, while customs revenue tends to decline.

See W. A. Chatto, *Facts and Speculations on the Origin and History of Playing-Cards* (1848); E. S. Taylor, *History of Playing-Cards* (1865); W. H. Willshire, *Descriptive Catalogues of Cards in the British Museum* (1877); *Playing-Cards of Various Ages and Countries, from Lady Charlotte Schreiber's Collection* (3 vols. 1892-95); Jessel, *Bibliography of Works in English on Playing-Cards* (1905); H. R. d'Allemagne, *Les Cartes à Jouer* (1906); besides separate articles on BEZIQUE, BRIDGE, CRIBBAGE, ECARTÉ, EUCHRE, LOO, PIQUET, POKER, WHIST, &c.

Carducci, GIOSUÈ (1836-1907), by his countrymen generally regarded as the foremost Italian poet amongst his contemporaries, was born at Val di Castello, near Pietra Santa, in the province of Pisa. He was the son of a physician, and his youth was spent in study. In 1860 he was appointed to a professorship in the university of Bologna. He was throughout his life a staunch Republican, and in 1867 was for a short while suspended from his professorship for having signed an address to Mazzini. In 1876 he was returned to the Italian parliament as member for Lugo di Romagna. His earliest poems, *Juvenilia* and *Levia Gravia*, were written in imitation of Manzoni and Alfieri. Cold and artificial, they contrast strongly with their author's later works. Signs of a transition in sentiment and in style appeared in the *Decennalia*, which dealt mainly with political events of the years 1860-70. The change became complete in the *Nuove Poesie*, in which Carducci, taking Hugo instead of Manzoni for his master, gave fiery expression to the most advanced political views. These poems are remarkable for the sustained power and dignity of the language and the frequent nobility of the thought. The *Odi Barbare*, written in metres borrowed from Horace, have excited the ardent admiration of Italians; to foreign critics, however, Carducci seems in these pieces to have erred in the rejection of rhyme. Carducci has been claimed as a leader by the *veristi*, on the strength, it would seem, of his revolutionary opinions and antagonism to the followers of Manzoni. See *Life* by Chiarini, and books by Jeanroy (1911) and Croce (1920).

Cardwell, EDWARD, VISCOUNT CARDWELL, was born in Liverpool, 24th July 1818, and educated at Winchester and Balliol College, Oxford. He became a barrister of the Inner Temple in 1838, and M.P. for Clitheroe in 1842. In parliament he attached himself to Sir Robert Peel, who appointed him Secretary to the Treasury (1845-46). From 1847 to 1852 he was member for Liverpool, and he was returned for Oxford city in 1852. President of the Board of Trade under Lord Aberdeen (1852-55), he carried through the Merchant Shipping Act of 1854; was Secretary for Ireland under Lord Palmerston (1859-61); and as Secretary for the Colonies under Lords Palmerston and Russell (1864-66) abolished transportation. In Mr Gladstone's Cabinet (1868-74) he was Secretary for War, and in 1871-72 carried through his great scheme of army reorganisation, which included the abolition of the purchase of commissions, the retirement of officers, the short service system and army reserve, the localisation of regiments, and improvements in military education (see ARMY). Conjointly with Earl Stanhope he was Peel's literary executor, and edited his *Memoirs* (1856-57). Raised to the peerage in 1874, he died 15th February 1886. See *Lord Cardwell at the War Office*, by General Sir R. Biddulph (1904).

Care or **Carl Sunday**, the Sunday before Palm Sunday, so named from the practice of eating gray pease, called carlings, fried in butter, pepper, and salt, on this day; connected with the Catholic custom of eating hallowed beans fried at this time.

Carelia. See KARELIA.

Carême. See QUADRAGESIMA.

Carême, MARIA ANTONIN, *chef de cuisine* and author, born in 1784 in Paris, where he died in 1833, wrote *Les Déjeuners de l'Empereur Napoléon*, *La Cuisine Française*, and other works connected with his craft. As Talleyrand's cook, he played an important part at the Congress of Vienna.

Caret (Lat., 'is wanting'), a character of this form, Λ , denoting that something has been omitted and is interlined.

Carew, THOMAS, poet, descended from an old family in Gloucestershire, was born about 1589, and after quitting Corpus Christi College, Oxford, without a degree, studied for a while in the Middle Temple. Between 1613 and 1619 he visited Italy, Holland, France; afterwards he rose into high favour with Charles I. Carew deserves mention chiefly as the precursor and representative of what may be called the courtier and conventional school of poetry, whose chief characteristic was scholarly ease and elegance, with a spice of indelicacy and even indecency. His poems, mostly lyrical, and treating of trifling subjects, are among the best of their kind, and exhibit much fancy and tenderness. He is often said to have died in 1639. The date however, is uncertain, and he may have lived much longer. His poems appeared in 1640; see editions by W. C. Hazlitt (1870), Ebsworth (1894), and Vincent (1899).

Carex, a very large and widely distributed genus of Cyperaceæ (q.v.), commonly known as Sedges, including many hundreds of species, distributed chiefly throughout temperate and arctic climates, about 60 species being natives of Britain. Though some grow in dry situations, the majority inhabit wet and swampy soils, of which they often form almost the sole vegetation. They are of no value as fodder, and in general occur only in very inferior pastures, from which drainage generally causes them to disappear. They are sometimes of use in converting swamps into dry ground; and their creeping rhizomes are often of service in binding the sands of the sea-shore, *C. arenaria* being carefully planted along the shores and dikes of Holland. The rhizomes of this and other species are sometimes used medicinally under the name of German Sarsaparilla, but are little esteemed. The leaves of other species are used for packing, and those of *C. brizoides* are a source of the 'sea-grass' of upholsterers, which is used as a cheap substitute for horse-hair. Some of the larger growing species are sufficiently conspicuous and graceful to be worth employment in appropriate situations by landscape-gardeners, and a variegated variety of *C. japonica* is cultivated by the florist. See a book by F. C. Crawford (1910).

Carey, HENRY, poet and musician, is believed to have been an illegitimate son of George Savile, Marquis of Halifax. The date of his birth is unknown, but his first volume of poems, published in 1713, was produced when he was very young. He wrote innumerable songs, witty poems, burlesques, occasional pieces, farces, and dramatic pieces, sometimes composing the accompanying music. He published over 200 works in all. His best-known poem is 'Sally in our Alley'; there seems no sufficient ground for attributing 'God save the King' to him, as is often done. He died suddenly, by his own hand apparently, in 1743.

Carey, HENRY CHARLES, political economist, was the son of Mathew Carey (1760-1839), a journalist and publisher, who in 1784 had emigrated from Ireland to Philadelphia, where Henry was born, 15th December 1793. He early became a partner in his father's bookselling business; and when in 1835 he retired from business to devote himself to his favourite study, he was at the head of the largest publishing concern in the United

States. He died 13th October 1879. His *Principles of Political Economy* (3 vols. 1837-40) had a marked influence on economic speculation. In 1838 he published *The Credit System of France*, *Great Britain, and the United States*; and in 1848, *The Past, the Present, and the Future*, a work marked by great vigour and originality. In 1853 appeared the *Letters on International Copyright*; in 1858-59, *Principles of Social Science* (3 vols.); in 1867, *Review of the Decade 1857-67*; and in 1872, *The Unity of Law*. The most important of these have been translated into most European languages. Carey was originally a zealous free-trader, but was ere long recognised as the head of a new school of political economy. According to his system, free trade was impossible in the existing state of American industry; it might be the ideal towards which the country should tend, but a period of protection was an indispensable stage in the progress toward it.

Carey, SIR ROBERT, youngest son of Lord Hunsdon, was born about 1560, and rose to eminence in the service of Queen Elizabeth, for the last ten years of whose reign he was English warden on the Border marches. He was present at her death-bed (1603), and in two and a half days galloped with the news to Edinburgh. Charles I., at his coronation, created him Earl of Monmouth; he died 12th April 1639, and left Memoirs which were edited by Scott (1808).

Carey, ROSA NOUCHETTE (1840-1909), writer of stories for girls, was born in London. She began to publish novels in 1868, and from that date to her death she wrote assiduously. Her last work was published posthumously.

Carey, WILLIAM, born near Towcester in 1761, was apprenticed to a shoemaker, joined the Baptists in 1783, and three years later became a minister, first at Moulton in Northamptonshire, and then at Leicester. A pamphlet which he published about this time attracted the attention of his co-workers in the ministry to the subject of Foreign Missions, and ultimately a missionary society, chiefly through Carey's exertions, was formed. Carey and a Mr Thomas were chosen its first missionaries to India in 1793. From that time until his death on 9th June 1834, Carey was indefatigable (under many difficulties, especially during the early years) in his efforts to spread the knowledge of the gospel among the heathen. Under his direction, the Serampore mission, of which he was the principal founder, had up to 1832 issued above 200,000 Bibles, or portions thereof, in about forty Oriental languages or dialects, besides a great number of tracts and other religious works in various languages. A great proportion of the actual literary labour involved in these undertakings was performed by Carey himself, who published valuable grammars and dictionaries of Bengali, Mahratta, Sanskrit, and other languages. From 1801 to 1830 he was Oriental professor at Fort-William College, Calcutta. See his *Life* by Culross (1881) and Dr G. Smith (1884).

Cargill, DONALD, one of the heroes of the Covenant, was born about 1619 at Rattray in Perthshire. He studied at Aberdeen and St Andrews, and in 1655 was ordained minister of the Barony parish in Glasgow. Deprived of his benefice for denouncing the Restoration, he became an indefatigable field preacher, fought at Bothwell Bridge, and took part with Richard Cameron in the famous Sanguhar declaration (1680). Alone, in the same year, he solemnly excommunicated the king, the Duke of York, and others at Torwood, Stirlingshire. A large reward was now offered for his capture. He was soon seized, and suffered with triumphant courage at the cross of Edinburgh, July 17, 1681.

Caria, in ancient geography, the south-western-most country of Asia Minor, bounded N. by Lydia, E. by Phrygia, SE. by Lycia, and W. and SW. by the Mediterranean. A large portion of what was Caria is mountainous, with forests of oak and pine, where large herds were anciently pastured. The most important river was the Mæander, famous for its windings. Among the chief towns were Cnidus, Halicarnassus, and Miletus. The early inhabitants, who seem to have been a people of Indo-European stock, akin to the Lydians, were a warlike race, and formidable as pirates, but gradually sank into a dependent state; their princes became satraps of the Persian empire. Very early there were extensive Greek colonies, Dorian and Ionian, on the coast; and the country subsequently passed into the hands of Alexander's successors and of the Romans. It was taken by the Osmanlis in 1336, and became part of the province of Aidin.

Cariacou, or CARJACOU, also called Virginian Deer (*Cervus virginianus*), a species of deer found in all parts of North America, from Mexico to about 43° N. lat., and from the Atlantic to the Pacific Ocean. It is the species commonly called Deer by the Anglo-Americans. It is smaller and more elegant than the common stag, and measures 3 feet in height at the shoulder. The colour is very variable—light reddish brown in spring, slaty blue in autumn, and dull brown in winter; the belly, throat, chin, and inner parts of the limbs white. The horns of the adult male are of moderate size, bent strongly backward, and then suddenly forward, so as to bring their tips nearly above the nose; they have several snags. The fawn is profusely decked with white spots, arranged in lines, and sometimes running into stripes. The Virginian deer is timid, and domesticated with some difficulty. It is a common form in European zoological gardens, and also in parks. Its palatable flesh used to be one of the chief sources of food-supply to the Indians. The name Cariacou is extended generally to several nearly allied species, found in Mexico, California, &c., and the title Cariacus is sometimes used technically for a sub-generic division of *Cervus*.

Cariama (*Dicholophus cristatus*), a South American bird, regarded by some as allied to Cranes, and referred to the order Grallæ, by others as a game bird, and placed among the Gallinacæ, but most probably ranked along with the Secretary among the Birds of Prey. The beak is hooked at the point, the forehead bears a tuft of feathers, the wings are short and little used, the tail is long and rounded, and the short claws are much bent and sharply pointed. It is larger than the common heron, predominantly brown and gray in colour, shy in habit and swift of foot, living on insects, amphibia, reptiles, and also small birds and mammals. The bird frequents the grassy regions of Guiana, Brazil, and Paraguay. Its flesh is much esteemed.

Caribbean Sea, lying between the Antilles and the South and Central American mainland, and communicating with the Gulf of Mexico by the Yucatan Channel, 120 miles wide. During the rainy season (July to October) hurricanes are not infrequent. A shallow bank extending from Honduras to Jamaica separates the two great depressions of the sea, of which the eastern and larger has a depth of 20,577, and the western 20,541 feet; and these are united by the strait (over 3300 feet) between Jamaica and Cuba and Hayti. The sea forms the turning-point of the Gulf Stream (q.v.).

Caribbee Bark, or PITON BARK, is the bark of *Exostemma caribæum* and other species, small West Indian trees of the sub-order Cinchonacæ, growing also in southern Florida. It was for-

merly imported as a substitute for cinchona bark, but contains none of its characteristic alkaloids.

Caribou is the American Reindeer (q.v.).

Caribs, an American Indian race, found by Columbus in possession of a large number of the West India Islands, from which they have since been either exterminated or expelled, but who still form a considerable family along the shores of the Caribbean Sea, from the Isthmus of Darien nearly to the mouth of the Amazon. The pure Caribs, mostly found about the Orinoco and in the forests of Guiana, have preserved the traditional warlike, savage, but intelligent features of the race. The native name is *Carina*, *Callinago*, or *Calina*, from which the term cannibal was derived; and most accounts describe the South American Caribs as still man-eaters. A mixed Carib tribe is found in Guatemala, and a few half-breeds also survive along the Mosquito coast, whither their ancestors were deported by the English from St Vincent in 1738. There is a reservation of land for a few Caribs in the island of Dominica. See Ober's *Camps in the Caribbees* (1880); Paton's *Down the Islands* (1888); Treves's *The Cradle of the Deep* (1908).

Carica. See PAPAW.

Caricature is a branch of satire, and the word is equally used to express either a pictorial or a descriptive representation, in which, while a general likeness is retained, peculiarities are exaggerated so as to make the person or thing ridiculous. Although sometimes applied to literary descriptions, the word caricature, when used alone, is generally understood to relate to design. Caricature being a natural expression of natural feelings, must be as old as man himself, and possibly the eccentric markings found on rocks and in caves are not entirely due to bad drawing, but were intended in certain cases to ridicule the artist's enemies. Examples of caricature have been found in the art of the Egyptians, the Greeks, and the Romans. Fortunately some Egyptian examples have been preserved, showing that the most ancient masters of the art did not spare even the sacred person of the king. One papyrus (the Satirical Papyrus of Turin), published as the last plate in Lepsius' *Auswahl*, contains rough sketches caricaturing the concerts depicted on the walls of the palace, also the battles, and particularly a scene on the walls of Ramses' pavilion, where the king is depicted playing chess with a girl of the harem. The king is drawn as a lion, the girl as a gazelle, and the whole has an undeniable humour in it that defies the touch of time. The popular pictures of the 'Dance of Death' in the middle ages may be looked upon in the light of caricatures. Although so considerable an antiquity may be claimed for the art, the name itself is quite modern, and being introduced from the Italian, it continued its foreign form for many years. The meaning is an overloaded representation, and the word is formed from the verb *caricare*, 'to load.'

One of the first writers to use the word *caricatura* was Sir Thomas Browne (1605-82), in his posthumous work on *Christian Morals*; and in the *Spectator* (1712) the Italian form is still retained: 'Those burlesque pictures which the Italians called *caricaturas*, where the art consists in preserving, amidst distorted proportions and aggravated features, some distinguishing likeness of the person, but in such a manner as to transform the most agreeable beauty into the most odious monster.' The word is not in Johnson's *Dictionary* (1755), but in 1788 Francis Grose wrote *Rules for Drawing Caricatures*, a work which was translated into French. Pictorial satires on the clergy were not uncommon in the middle ages, and in the reigns of Henry

VIII. and Elizabeth the pope was frequently satirised. During the Civil Wars, the satirists to some extent thrived in England. The reign of William III. again was a period of political satire, when Romeyn de Hooghe was the chief artistic champion of the king of England.

Modern caricature, however, may be said practically to commence with Hogarth (1697-1764), who lashed social vices instead of confining himself to the portrayal of political disagreements. Hogarth was succeeded by a host of talented artists, whose productions became the rage. Of these the most prominent were John Collet (1725-80), Henry William Bunbury (1750-1811), Thomas Rowlandson (1756-1827), George Moutard Woodward, John Heinrich Ramberg (1763-1840), James Gillray (1757-1815), styled 'the prince of caricaturists,' Denis Dighton (1792-1827), and James Sayer, commonly called Pitt's caricaturist. Of these Gillray and Rowlandson stand out as the chief. Bunbury's works were engraved by Rowlandson, who gave them much of his own style. The history of the time (grossly exaggerated, it is true) is to be found written in the works of these caricaturists. To these engravings we must go to understand the manners of the time, as well as to see what was the contemporary public opinion of Bute and Wilkes, of Pitt and Fox, and the political leaders of the Georgian era. George IV. was the object of satirical prints to an extraordinary degree. So great was the popularity of these caricatures, that shops were opened for their exclusive sale, and particular publishers devoted themselves to this business alone. Mention should also be made of John Kay, whose portraits illustrate so remarkably the history of Edinburgh life at the end of the 18th and beginning of the 19th century.

To eyes educated by the refined satire of the present day, the works of Gillray and Rowlandson and their followers appear singularly coarse. These caricatures are vigorous, but they are frequently disgusting to our taste. With the early part of the 19th century a complete change in the character of caricature took place, and for this ascendancy of good feeling we are largely indebted to the two Doyles, John and Richard, father and son.

John Doyle commenced his political sketches in 1829, and they became famous as the caricatures of H.B. It is scarcely possible to imagine two styles of art more distinct than those exhibited respectively in the caricatures of Gillray and Doyle. H.B.'s sketches are sometimes styled weak, but they exhibit a vivid picture of the party politics of the period over which the series extend. The Duke of Wellington, Sir Robert Peel, and the other leaders of the time stand out before us now as they appeared to their contemporaries. In the works of the older caricaturists likenesses were to some extent retained, but the persons caricatured were usually depicted as monsters rather than as human beings. In the caricatures of H.B. the resemblance was perfect, and it was the position rather than the person that was distorted. There was plenty of satire, but it was of a refined character. When H.B.'s sketches were discontinued, the weekly periodical *Punch* was started (1841), and Richard Doyle designed the well-known cover. In its pages may be seen the finest examples of delicate caricature by Leech, Keene, Tenniel, Du Maurier and other artists of repute, that have been produced. It may be remarked that our modern Hogarth, George Cruikshank, lived through the periods distinguished by the two styles of caricature. His earliest satires are in the manner of Rowlandson, while his later ones are in the more refined style of the present day. A return to the more robust style of the older caricaturists was made by Pellegrini ('Ape'),

Leslie Ward ('Spy'), and others in *Vanity Fair*, where the portraits of celebrated men were drawn in an exaggerated manner, so as to produce a ludicrous effect without essentially destroying the likeness. Other well-known names are those of Linley Sambourne, Harry Furniss, Phil May, E. T. Reed, Sir F. Carruthers Gould, Max Beerbohm, and E. X. Kapp. The American counterpart to *Punch* is the vigorous and clever *Puck*. Equally well known are the *Fliegende Blätter* and *Simplicissimus* of Munich, and the less artistic *Kladderadatsch* of Berlin. Eminent in America have been Thomas Nast and J. F. Keppler, both of German birth; and in Holland, Louis Raemaekers.

Caricature in France may be said to date from about 1830, from the foundation by Philipon of *La Caricature*, and the greatest names are still those of Daumier, Gavarni, Grandville, and Monnier. Daumier combined in a remarkable degree the sense of form with that genius for happy exaggeration which is characteristic of the highest types of caricature. Monnier has secured his own immortality in that of his creation, Joseph Prudhomme. Grandville is, by universal consent, superb in portraiture. Other names are those of Decamps, Travès, Charlet, Raffet, Isabey, Giraud, Carle Vernet, Cham, Grévin, and 'Caran d'Ache' (Emmanuel Poiré).

A *History of Caricature and Grotesque in Literature and Art* was published by Thomas Wright in 1865, but the most important work on the subject is the *Catalogue of Satirical Prints and Drawings in the British Museum* (with Hawkins's valuable memoranda). Parton's *Caricature and other Comic Arts* (New York, 1877) deserves mention. Everitt published in 1886 *English Caricaturists of the 19th Century*. Joseph Grego has published two copiously illustrated works on caricatures, one devoted to the productions of Gillray, and the other to those of Rowlandson. See also Auguste Filon's *La Caricature en Angleterre* (1902); and on caricature in France, Dayot's *Maîtres de la Caricature Française au XIX^e Siècle* (1888); Grand Carteret's *Les Mœurs et la Caricature* (1886-88); Champfleury's *Histoire Générale de la Caricature* (5 vols. 1865-80; supp. 1885); George Paston's *Social Caricature in the Eighteenth Century* (1906).

Caricature Plant (*Graptophyllum hortense*), a plant of Ceylon, of the family Acanthaceæ, cultivated for its fantastically variegated leaves. Other species of the genus are found in Australia and Polynesia.

Caries ('rotteness') is a disease of bone analogous to the ulceration of soft tissues. It is characterised by a gradual loss of substance, from the particles of bone being absorbed, or being cast off and washed away in a purulent discharge. It is usually a form of tuberculosis, especially when it occurs in children, and is generally due to the 'bovine' type of the tubercle bacillus. On examination, the bone-cells are found filled with a reddish glairy fluid and deposits of tubercle. After caries has existed for some time, an abscess forms, and bursts; its aperture remains open, discharging a thin fluid, which contains particles of the bone. If a probe be passed through this opening, it will be felt to sink into some soft gritty substance; this is the carious bone, which, if removed and well washed, will be found to resemble in whiteness and fragility loaf-sugar softening in hot water.

Caries may attack any bone, but it usually selects the skull and face, the vertebrae, the bones of the hand or foot, and the soft ends of long bones forming joints, especially in the lower limbs. To this disease most deformities not congenital are owing. The carious vertebrae yield under the weight of the trunk, and the spine curves forwards, or to one side. In the joint-ends of bones the part enlarges, the cartilages become affected, matter forms, and amputation of the limb, or excision of the joint, is frequently necessary to save the

patient's life. Too often the disease recurs with night-sweats, hectic symptoms, and death.

If it affect a small bone, that bone may be entirely removed; and if the disease is strictly limited to the ends of bones forming a joint, these may be excised. Since 1860 great advances have been made in this department of surgery, and caries of the joints is comparatively seldom counted a sufficient reason for amputation; the knee, hip, shoulder, elbow, ankle, and wrist joints have all been repeatedly excised successfully.

Various forms of splint—e.g. Thomas's splints—have been introduced, which serve to keep the affected joint at rest, while permitting the patient to get a maximum of exercise for the remainder of the body in the fresh air. The tissues are thus placed in the best possible condition for overcoming the disease.

Judicious change of air, especially to a warm seaside place, and the administration of tonics, cod-liver oil, &c., are also of great importance. Under such treatment, with careful attention to free exit of the discharge and cleanliness of the wound, recovery often takes place without operation; but when the natural processes are not able to effect this in those parts where the diseased bone can be reached, it should be gouged or scraped away, so as to leave a healthy surface of bone, which may granulate up, and heal. See BONE. Caries of the teeth is dealt with at TEETH.

Carigna'no, a town of Piedmont, on the Po, 11 miles S. of Turin, with some fine churches, and manufactures of silk-twist. It gives the title of prince to the reigning branch of the House of Savoy. Pop. 5000.

Carillon. See BELL.

Carima'ta, a name applied to the strait between Borneo and Biliton; also to a cluster of a hundred islets and reefs (area, 57 sq. m.; pop. 500) in that strait; and lastly, to the principal member of the group, whose highest point reaches 2600 feet.

Carinaria, a genus of free-swimming marine snails (Gasteropods) belonging to the small order Heteropoda. They are beautiful transparent animals, with a thin brittle shell (like a miniature paper nautilus) covering only the visceral hump and leaving even the gills exposed, and with the ventral surface or 'foot' pulled out into a movable tail, and bearing anteriorly a leaf-like swimming fin, provided with a sucker. The head protrudes far in front of the soft body, and bears a pair of tentacles. The organs and their working can be beautifully seen within the transparent body. The sexes are separate. Carinaria is represented by eight species in warmer seas. They swim back downwards, and feed voraciously on other marine animals, such as jelly-fish and pteropods. The common Mediterranean species, *C. mediterranea*, may be over six inches in length, has a violet proboscis and a rose-coloured foot, and is a beautiful transparent snail. The neighbouring genus Pterotrachea has no shell.

Carinate Birds, the technical name for the ordinary flying birds, in which the muscles working the wings are partly inserted on a prominent keel (Lat. *carina*) on the breast-bone. See BIRD.

Carini, a town of Sicily, 12 miles W. by N. of Palermo. It has an old castle, and a population of 13,000, chiefly engaged in fishing.

Carinthia (Ger. *Kärnten*), an Austrian land, forming part of the old kingdom of Illyria, with an area reduced in 1919 from 4000 to 3500 sq. m., and a population of 366,500; capital, Klagenfurt. The principal river is the Drave, which passes through the country from west to east in a course of 100 miles.

The general aspect of the country is mountainous, with long deep valleys, that of the Drave widening at Villach and Klagenfurt into a great plain, and dividing the *Noric* from the *Carinthian Alps*. The loftiest point is the Grossglockner (12,450 feet). There is very little tillage, owing to the mountainous character of the country, great part of which is covered with pasture or brushwood. Many horses and cattle are reared and exported. The principal products are lead and other metals. The manufactures include metal goods, leather, paper, cement, woollens, silk stuffs, and cottons. Carinthia, which derives its name from the Celtic *Carni*, belonged before the time of Augustus to Noricum, afterwards to the Roman empire. By-and-by the Carni were swept away in the deluge of immigration from the east, and Slavs settled in the country. In 1335 it came into the possession of Austria (q.v.). Before the cession in 1919 of a south-west corner to Italy, and a south-east to Yugoslavia, the population was 76 per cent. German, 21 per cent. Slovenian. Klagenfurt area decided by plebiscite (1920) to remain Austrian.

Carisbrooke, a village in the Isle of Wight, 1 mile SW. of Newport. In its ruined castle Charles I. was imprisoned (1647-48), as were also his children Prince Henry and the Princess Elizabeth, the latter of whom died here. From the castle well, 200 feet deep, the water is drawn by a donkey inside a wheel. A Norman castle was built here by William Fitzosborne; it was besieged by King Stephen; the outworks date from the time of the Armada panic. Carisbrooke was a Roman station, and a Roman villa was discovered here in 1859.

Carissa, a genus of Apocynaceæ. *C. Carandas* is a thorny shrub, much used for fences in India, and the fruit for tarts and preserves. Some species are as bitter as gentian, notably *C. xylopicron*, the *Bois amère* of Mauritius.

Carissimi, GIACOMO, composer, born in 1604 at Marino, near Rome, was organist from 1628 in Rome, and died there in 1674. His greatest service was the development of the sacred cantata. The finest of his oratorios, including *Jephtha*, have been edited by Chrysander in *Denkmäler der Tonkunst* (vol. ii. 1882).

Carità (Ital.), in Art, the technical name for a representation of Maternal Love.

Carlaverock. See CAERLAVEROCK.

Carlén, EMILIE, a Swedish novel-writer, was born 8th August 1807 at Strömstad, near the Christiania Fjord. It was not till 1838 that her first novel, *Waldemar Klein*, was given to the world. She was then a widow; and in 1841 she married her second husband, J. G. Carlén, a lawyer and poet, in Stockholm. Her fictions, chiefly founded on the characteristics of the lower and middle classes, though faulty in many respects, are rich and striking in incident. Her novels were collected in 31 vols. (Stockholm, 1869-75), and many of these have been translated into English. She died at Stockholm on the 5th February 1892. See her *Reminiscences of Swedish Literary Life*.

Carleton, GUY. See DORCHESTER (LORD).

Carleton, WILL, American author, was born in Hudson, Michigan, 21st October 1845. He graduated at Hillsdale College in that state; and soon after completing his studenthood, he began to lecture in various parts of the United States and Canada. His best-known works are ballads of domestic life. His fresh and striking *Farm Ballads* (1873), *Farm Legends* (1875), *Farm Festivals* (1881), *City Ballads* (1885), *City Festivals* (1892), and *Rhymes of our Planet* (1895) attained a wide popularity on both sides of the Atlantic. He died 15th January 1913.

Carleton, WILLIAM, Irish novelist, was born in 1794 at Prillisk, in County Tyrone. Of peasant birth, the youngest of fourteen children, he received some scanty instruction in a hedge-school; and falling in with a copy of *Gil Blas* about the same time that he gave up all thoughts of the priesthood, he came up to Dublin with only three shillings in his pocket. He thought first of turning bird-stuffer, of enlisting, then took to tuition, and finally to literature, contributing to the *Christian Examiner* a series of sketches, which in 1830 he republished under the title of *Traits and Stories of the Irish Peasantry*. Their freshness of style pleased the public; a second series (1833) was no less well received; and in 1839 appeared the powerful story, *Fardorougha the Miser*, in several passages of which, however, his humour becomes extravagant. He next published a series of tales (3 vols. 1841), mostly of pathetic interest, but including a very genial and humorous sketch of the *Misfortunes of Barney Branagan*, which proved a great favourite. *Valentine McClutchy* (1845) is half-political and half-religious in its tendency, defending the Irish Catholic priesthood, and advocating repeal of the Union. *Rody the Rover* (1846), *The Black Prophet* (1847), and *The Tithe Proctor* (1849) are also worthy of mention. Carleton's admirers have hailed him, not without contradiction, as the true historian of the Irish people. He was shiftless, improvident, affectionate to a fault. Latterly he had a pension of £200. He died at Dublin, 30th January 1869. See the *Life* (containing part of his autobiography) by O'Donoghue (1896).

Carleton Place, a town and port of entry in Lanark County, Ontario, Canada, 28 miles SW. of Ottawa. It stands on the Canadian Mississippi River. Its station is the junction for the Brockville branch of the Canadian Pacific Railway. Water-power is abundant, and there are railway and other machine-shops, foundries, large sawmills, woollen-mills, and other works. Pop. 3800.

Carli, GIOVANNI RINALDO (1720-95), professor of Astronomy at Venice, wrote on numismatics, on Istrian and other antiquities, and on classical subjects, and against Rousseau.

Carlile, RICHARD, a much-prosecuted Radical, was born at Ashburton, in Devonshire, 8th December 1790. After some education at the village free school, where Gifford had been a scholar, he served in a chemist's shop, and afterwards as apprentice to a tinman, whose undue severity kept alive the rebellious spirit of the boy. Paine's *Rights of Man* converted him into a Radical propagandist, and in 1817 he began to vend a London weekly, *Black Dwarf*, next sold thousands of Southey's *Wat Tyler*, reprinted Hone's *Parodies*, and wrote a series of imitations of these, for which he was rewarded with eighteen weeks in the King's Bench. For reprinting Paine's works and some similar books, he was sentenced, after a three days' trial, in November 1819 to a fine of £1500 and three years' imprisonment in Dorchester gaol. Here he at once began to issue his periodical, *The Republican*, of which the first 12 vols. are dated from his prison. His wife, for continuing to publish, was sentenced in 1821 to two years' imprisonment. But the indomitable Radical continued still to publish spite of a public subscription, for the prosecution of his assistants, of £6000, headed by the Duke of Wellington; of repeated seizures of his stock; of a three years' extension of his own confinement in lieu of the fines; the imprisonment of his sister for a year besides a fine of £500; and the imprisonment of nine of his shopmen in terms of from six months to three years. After his release Carlile continued his activity, editing *The Gorgon*, and holding free discussions in the London Rotunda.

Three more years' imprisonment he suffered for refusing to give sureties for his good behaviour after a prosecution that grew out of his refusal to pay church-rates; and a second period of ten weeks, in 1834-35, for resisting the same payment, brought up the total of the imprisonment of this much-enduring man to nine years and four months. He died 10th February 1843. This martyr at least was as ready to suffer as to bluster, and may safely be said to have done as much as any Englishman for the freedom of the press. See Holyoake's *Life and Character of R. Carlile* (1848).

Carlina Thistle (*Carlina*), a beautiful genus of Compositæ, closely allied to the true thistles, from which they are distinguished by the inner spreading bracts of the involucre, which, coloured and shining, are remarkably hygrometric, expanding in dry and closing together in wet weather, and this property they retain for a long time; the heads of flowers are therefore often nailed on cottage-doors in many parts of Europe to indicate the weather. The name is said to be derived from a legend that an angel showed the root of one of the species, *C. acaulis*, to Charlemagne as a remedy for a plague in his army. Linnaeus, however, tells the story,



Carlina Thistle (*Carlina acaulis*).

without the angel, of the army of Charles V., while the most sceptical regard the name as merely a corrupt diminutive of Ital. *cardo* (dim. *cardina*), 'a thistle.' The root is certainly a drastic purgative, and hence was formerly held in high medical repute; now, however, it is quite disused, save in veterinary practice. The only British species is *C. vulgaris*.

Carlisle, a parliamentary and municipal borough, the county town of Cumberland, stands on a gentle eminence in a wide-spreading plain, at the influx of the Caldew and Petteril to the Eden—three streams that nearly encircle it. An important railway centre, it is 299 miles NNW. of London, 101 miles S. of Edinburgh, 22½ E. by N. of its seaport, Silloth, and 66 W. by S. of Newcastle. In spite of its hoar antiquity, 'merry' Carlisle as a whole is disappointingly modern, its gates having vanished, and almost the whole of the walls. The castle was founded in 1092, and now serves as a barrack. The remains of its Norman keep form a massive tower; but that portion of the fortress in which Mary Queen of Scots was for two months imprisoned (1568) was demolished in 1835. The cathedral, founded by William Rufus, and dedicated in 1101 by Henry I., in 1133 was made the cathedral church of the newly-formed diocese. It has four times suffered by fire, the greatest in 1292; and ranging in date between 1092 and 1419, it comprises

every variety of style from Norman to Perpendicular. The fragment of the Norman nave was long used as a parish church. The choir, mainly Decorated in style, is 137 feet long, 71 broad, and 75 high. It is one of the finest choirs in England, the exquisite tracery of its nine-light east window being of matchless beauty. The central tower, only 127 feet high, formerly supported a timber spire, which was removed in the 18th century. There are monuments and other memorials to Paley, Dean Close, and Archbishop Tait's five children; and in the nave (then St Mary's Church) Scott married Miss Carpenter or Charpentier (1797). The building was restored in 1853-57. The court-house and county gaol are the most noticeable of the public buildings; the Eden is crossed by a handsome five-arch bridge (1851); and in the town are statues of the second Earl of Lonsdale and of James Steel, editor of the *Carlisle Journal*. The chief branches of industry are cotton, calico, hat, and iron manufactures; fancy biscuits are largely made; and the Eden has salmon-fisheries. The parliamentary representation was reduced to one member in 1885. Pop. (1801) 10,221; (1851) 26,310; (1921) 52,600. The *Lugwallum* of the Romans, and *Caer-Luel* (hence *Carlisle*) of the Britons, the town was destroyed by the Danes in 875, and restored by William Rufus in 1092. From its position as a Border fortress, it has a wealth of martial memories—none more famous than the rescue of 'Kinmont Willie' by Buccleuch from Carlisle Castle in 1596. During the Great Rebellion it twice surrendered to the Parliamentarians (1645-48); and in the '45 it was held for a time by the Jacobites, thirty-one of whom were afterwards executed on Haraby Hill. The Carlisle Tables of Mortality, based on the deaths here in 1779-87, are much used in Insurance (q.v.).

See Freeman's *English Towns* (1883); Bishop Creighton's *Carlisle* ('Historic Towns,' 1889); R. S. Ferguson's *Carlisle* ('Diocesan Histories,' 1890).

Carlisle, capital of Cumberland county, Pennsylvania, 19 miles WSW. of Harrisburg by rail, is the centre of a rich agricultural country. It is the seat of Dickinson College (Methodist), a government school for Indian children, and has barracks, machine-shops, a foundry, and manufactures of railway cars, carriages, carpets, windows, and shoes. It was shelled by the Confederates in 1863. Pop. 11,000.

Carlisle, GEORGE WILLIAM FREDERICK HOWARD, seventh EARL OF, K.G., was born in London, April 18, 1802. Educated at Eton and Christ Church, Oxford, he took in 1821 the Chancellor's and Newdigate prizes, and graduated with a first-class in classics. In 1826 he was returned for the family borough of Morpeth, and at once attached himself to Earl Grey and the cause of parliamentary reform. In 1830 he, along with Henry Brougham, was elected for Yorkshire, and after the Reform Bill he was returned for the West Riding, a seat which he lost in 1841, but recovered in 1846. Under Lord Melbourne, he was Chief-secretary for Ireland (1835-41), and, under Lord John Russell (1846-52), Chief-commissioner of Woods and Forests, and afterwards Chancellor of the Duchy of Lancaster. In 1848 he succeeded to the peerage. Palmerston appointed him Lord-lieutenant of Ireland in 1855, and again, on the downfall of Derby's government, in 1859. Carlisle obtained some literary reputation by his lectures on his travels in the United States, and on the life and writings of Pope, his *Diary in Turkish and Greek Waters*, and a volume of posthumous *Poems*. He died at Castle Howard, December 5, 1864.

Carlists, the name given to the supporters of the Spanish pretender, Don Maria Isidor Carlos de Bourbon, who was born March 29, 1788, the second

son of Charles IV. of Spain, and was educated chiefly by priests. After the expulsion of the French from Spain, and the re-accession of his brother, Ferdinand VII., who had had no children from three marriages, Don Carlos naturally began to cherish the hope of succeeding to the throne. A fourth time, however, the indefatigable Ferdinand married, and the result was a daughter, the Infanta Maria Isabella (queen of Spain till her deposition in 1868), born October 10, 1830. Now as the Salic Law excluding females from succession to the throne, introduced into Spain by Philip V. in 1713, had been abrogated after much hesitation by Ferdinand at the instigation of his new wife, Christina, in a formal 'Pragmatic Sanction,' four months after their marriage, the birth of this daughter completely destroyed the hopes of the Carlists. As Don Carlos still continued his agitation, he was banished in 1833 to Portugal, and soon afterwards was commanded to reside in the Papal States. But before he had embarked for Italy, King Ferdinand VII. died, September 29, 1833. The child Isabella was at once proclaimed queen with her mother Christina as regent; she was supported mainly by the liberals in the state, while Don Carlos rallied round him chiefly the supporters of absolutism. His chief strength lay in the indomitable courage of the inhabitants of the Basque provinces, whose ancient *fueros* the Liberals had foolishly refused to confirm, and here the struggle raged hotly for some years. Under Zumalacarregui and Cabrera the Carlists had at first considerable success, but were at length subdued by Espartero in 1839. Meanwhile the claim of Don Carlos had been recognised not only by the Carlists, but also by Dom Miguel in Portugal; the latter, however, was banished by the quadruple alliance of Spain, Portugal, England, and France. In June 1834 Don Carlos embarked for England, but in the following month he returned to the Continent, and passed in disguise through France into the northern provinces of Spain, whence he was ultimately compelled to escape into France. In 1836 his claims to the throne were unanimously rejected by the Constituent Cortes; in 1844 he abdicated in favour of his eldest son. He died at Trieste, March 10, 1855.—DON CARLOS, his son, born 1818, was better known as the Count de Montemolin. This second pretender made an attempt in 1849 to pass under a disguise through France into Spain, but failed. In 1860 an attempt was made at Tolosa in Valencia to stir up another Carlist insurrection, in consequence of which the Count de Montemolin and his brother Ferdinand were arrested, but liberated after they had signed a renunciation of all their claims to the Spanish throne. He died in 1861.—The next representative of the Carlist pretensions, his brother, DON JUAN (1822-87), in 1868 renounced his claim in favour of his son, DON CARLOS the third (1848-1909), on whose behalf Carlist risings—speedily repressed—took place in 1869, 1870, and 1872; but the insurrection headed by him in person after the abdication of King Amadeo in 1873 proved much more formidable, and kept the Basque provinces in great confusion till the beginning of 1876, when it was finally crushed, and the last of their ancient privileges stripped from the Basques, who showed heroic courage in a lost cause. Don Carlos crossed into France, was expelled in 1881 for expressing sympathy with the Legitimists (some of whom regarded him as the true heir to the throne of France also), and made his home in Venice. His pretensions were inherited by his son DON JAIME (born 1870), an officer in the Russian service. In his time the Carlists split. Don Jaime was disavowed by the leader, Vasquez de Melle, but continued to be the head of the movement, which

had lost all practical significance. See books on modern Spain by Martin Hume (1899) and Butler Clarke (1907).

Carlo Dolci. See DOLCI.

Carlos, DON. See CARLISTS.

Carlos, DON, son of Philip II. by his first marriage with Maria of Portugal, was born at Valladolid, July 1545. After his recognition as heir to the throne, Don Carlos was sent to study at the university of Alcalá de Henares; where, however, he profited so little, that the king, regarding him as unequalled to reign, invited a nephew, the Archduke Rudolf, to Spain, intending to make him heir to the throne. The weak intellect, with vicious and cruel tendencies, which the young prince showed early, may have been due to an injury to his head from a fall down the stairs at Alcalá de Henares; or more probably was congenital through the fatal descent from 'Juana la loca,' and only aggravated by his accident. Excluded from all participation in the government, he early conceived a strong aversion towards the king's confidants, and especially was unwilling that the Duke of Alba should have the government of Flanders. In confession to a priest, on Christmas eve 1567, he betrayed his purpose to assassinate a certain person; and as the king was believed to be the intended victim, this confession was divulged. The papers of Don Carlos were seized; he was tried and found guilty of conspiring against the life of the king, and of traitorously endeavouring to raise an insurrection in Flanders. The sentence was left for the king to pronounce. Philip declared that he could make no exception in favour of such an unworthy son; but sentence of death was not formally recorded. Shortly afterwards he died, July 24, 1568, and was interred in the Dominican monastery, El-Real, at Madrid. The suspicion that he was poisoned or strangled has no valid evidence to support it, and natural causes, as constant fever, a depraved appetite, and an injury to the brain, are of themselves enough to account for his death. The enemies of Philip II. were eager to prove him the murderer of his son, and much has been written on this problem. The version of the story which obtained so much currency through *Don Carlos*, the great tragedy of Schiller, was due to the romancing pen of Saint-Réal in 1672. Its credibility was shattered first in 1817 by the Spanish writer, Llorente, and in 1829 by the learned Ranke in vol. xlv. of the *Wiener Jahrbücher der Literatur*. The most important contribution to the question since is Gachard's *Don Carlos et Philippe II.* (2d ed. Paris, 1867). A new and not unfavourable light on Philip's character as a father has been thrown by the publication of *Lettres de Philippe II. à ses filles* (Paris, 1884) by the same editor. See also Maurenbrecher, *Don Carlos* (2d ed. Berlin, 1876), and Stirling-Maxwell, *Don John of Austria* (1883).

Carlovingians, or KARLINGS, the second dynasty of Frankish kings. The family came from the eastern part of the Frankish kingdoms, and its origin is traced to Arnulph, Bishop of Metz, at the beginning of the 7th century. Pepin, a grandson of the bishop, became Mayor of the Palace to the Frankish kings of the Merovingian line. Pepin's natural son, the famous Charles Martel, and Charles's son Pepin, followed in the same office. They were the real rulers of the Frankish monarchy, till in 752 Pepin dethroned the last of the *faiveant* Merovingian sovereigns and placed himself on the throne. Incomparably the greatest of the line was Charles the Great (Charlemagne), from whom it was named, and who in 800 was proclaimed Emperor of the West. Charles's son, Louis (814-840), was a weak ruler, after whose death the great Frankish empire erected by Charlemagne was divided in 843 between

his three sons, Lothar, Louis, and Charles. United in 884 under Charles the Fat, the empire was finally broken up in 887 into divisions roughly corresponding to the modern France and Germany with Lorraine and Burgundy between them. Members of the Carlovingian house, however, continued to rule in Germany till 911, and in France till 987, when they were superseded by the House of Capet. The Carlovingian kings had for some time previous possessed no real power. A subsequent marriage, however, connected their family with that of the Capets, and enabled the kings of France to trace their descent from Charlemagne.

The Carlovingian dynasty figures in the early history of France as the ally of the church. It aided the popes against the Lombards; made war on the Aquitanians, who pillaged and despoiled the churches; established the temporal power of the successors of St Peter; subdued and converted the still pagan Saxons; and fought the Mohammedans in Spain. Nor, on the other hand, do we find the church ungrateful: it sanctioned, by benediction and prayer, the conquests of this powerful family; in various ways impressed its sacred stamp of approbation upon it; and for its sake resuscitated the imposing idea of an empire of the West. But this alliance which was advantageous to the policy of kings like Pepin and his son Charlemagne, because they had genius, vigour, and design, became at a later period, under their feeble successors, a chief cause of the overthrow of the dynasty, for the clergy after 814 grew stronger and more exacting every day, and forced the monarchs to new concessions.

The word Carlovingians is formed on a false analogy from Merovingians (q.v.) or Merwings; it should be *Carolings* or *Karlings*, and means descendants of Karl the Great, or Charlemagne.

Carlo'vitz, or KARLO'WITZ (in England, however, usually *Car'lovitz*; Croat. *Karloveci*), a town of the Yugoslav state, in Slavonia, on the right bank of the Danube, 30 miles NW. of Belgrade. It has a Greek cathedral, and is noted for its wine, which—especially the red variety—ranks with the best and strongest, and is largely exported. Pop. 5500. The treaty of Carlovitz was concluded, in 1699, between the allies Austria, Russia, Poland, and Venice, on one side, and the Porte on the other, and provided that Austria should repossess the territories captured by the Turks during two centuries, including Hungary, Slavonia, &c.; that Venice should hold the Morea; that Poland should take back Podolia and part of the Ukraine; and that Russia should have the territory of Azov.

Carlow, a small inland county of Ireland, in the province of Leinster, with an area of 346 sq. m. Except on the south-east border, where Mount Leinster rises to 2610 feet, Carlow is a triangular fertile level, or gently undulating plain, between the Wicklow and Wexford range of hills on the east, and the highlands beyond the Barrow on the west. The chief rivers are the Barrow and Slaney. The predominant rock is granite, covered in the middle plain, or richer tracts, by limestone gravel, on which are fine loams and pasture. In the uplands the soil is gravelly. Lower Carboniferous Limestone crops out in the valley of the Barrow. On the west side of the county begins the great coal district of Leinster. Barely one-third of the entire area is under oats, wheat, potatoes, and other crops. There are many dairies on the plains. Along the Barrow, which falls more than a foot per mile, are many large corn-mills. Pop. (1841) 86,228; (1881) 46,568; (1911) 36,252, of whom 89 per cent. are Catholics. Along with Kilkenny the county returns four members to the Free State

parliament. It sent one member to Westminster till 1922. The chief towns are Carlow, Bagenalstown, and Tullow. Several engagements occurred in the county during the Irish rebellion of 1798. The chief antiquities of Carlow are cromlechs, castles, and the cathedral church of Old Leighlin. A cromlech near Carlow town has a covering stone 23 feet long, and of nearly 90 tons weight.

CARLOW, the county town, stands at the influx of the Burren to the Barrow, 56 miles SW. of Dublin by rail. It has a Catholic cathedral and divinity college, the county court-house, extensive flour-mills, and is the emporium for the agricultural produce of the district. Pop. (1851) 9121; (1911) 6619. Till 1885 it returned a member to parliament. There are remains of a castle, picturesquely situated on an eminence on the Barrow, founded in 1180 by Sir Hugh de Lacy. In 1361 the Duke of Clarence established the exchequer of the kingdom in this place. It constituted one of the boundaries of the Pale, beyond which the king's writ was not recognised by the 'Irishry.' The town grew up around this castle, which was dismantled after its capture by Ireton in 1650. In 1798 the rebels attacked the town, but were repulsed by the garrison and yeomanry, and 600 of them killed. The Barrow is here navigable for small craft to its junction with the Grand Canal at Athy.

Carlsbad (Czech *Karlovy Vary*), a town in Bohemia, on the Tepl, near its influx to the Eger, 116 miles W. by N. of Prague by rail. It is widely celebrated for its hot mineral springs, and frequented in summer by visitors of the most aristocratic character from all parts of Europe. The permanent inhabitants (20,000) are very industrious, making jewellery, porcelain, and various articles such as are likely to find ready purchasers among the visitors, who in the season—April to October—number from 25,000 to 35,000. Set in most lovely scenery, the town is well built, and offers good accommodation for its guests. The temperature of the hot springs varies from 117° to 167° F. The principal spring, the Sprudel, has a very large volume, and is forced up to a height of 3 feet from the ground. Altogether, the daily flow of the springs of Carlsbad is estimated at 2,000,000 gallons. The principal ingredient in the water is sulphate of soda. The whole town of Carlsbad appears to stand on a vast caldron of boiling water, which is kept from bursting only by the safety-valves the springs provide. Carlsbad was made a free town by Joseph I. in 1707, the first Kurhaus was built in 1711. In 1812 the reactionary Carlsbad Decrees were issued against liberalism and the Burschenschaft (q.v.).

Carlsburg. See KARLSBURG.

Carlshamn, a fortified seaport on the south coast of Sweden, 30 miles W. of Karlskrona, and 339 miles SSW. of Stockholm by rail. Founded in 1664, it has manufactures of tobacco, brandy, &c., and a considerable trade. Pop. 7000.

Carlskrona, the capital of a Swedish province, is built on five rocky islets in the Baltic, 240 miles (by rail 350) SSW. of Stockholm. It was founded in 1680 by Charles XI., who gave it his own name, and made it the great naval station and arsenal of Sweden, instead of Stockholm. It has a magnificent harbour, with a sufficient depth of water to float the largest vessels. The only practicable entrance is strongly defended. Population, 27,500.—The coast province of Blekinge or Carlskrona has an area of 1164 sq. m., with a population of about 150,000.

Carlsruhe, or **KARLSRUHE**, the capital of the state of Baden, is situated 5 miles east of the Rhine, and 39 WNW. of Stuttgart, 34 SSW. of

Heidelberg. Founded in 1715, and built in the form of a fan, with thirty-two streets radiating from the palace, it has a number of fine buildings—the palace (1751-76), the parliament-house (1845), the theatre (1853), the town-hall (1821), the museum (1852), with the state library (Badische Landesbibliothek). Before the palace stands a bronze statue of the city's founder, the Margrave Charles William; and in the market-place is a stone pyramid enclosing his remains. The manufactures include machines of various sorts, engines, locomotives, railway carriages and wagons, jewellery, carpets, chemicals, and cloth. Pop. 140,000.

Carlstad, a town of Sweden, on the island of Tingvalla, close to the northern shore of Lake Wener, 205 miles WSW. of Stockholm. Connected with the mainland by two bridges—one of which is a handsome structure—and greatly improved since the fire of 1865, it is a well-built place, with a cathedral, and a considerable trade. Pop. 20,000.

Carlstadt (Croat. *Karlovac*; Magy. *Karolyvaros*), a fortified town of Croatia, on the Kulpa, 32 miles SW. of Zagreb. It is the seat of a Greek bishopric, and has a large transit trade. Pop. 10,000.—**CARLSTADT**, in Bavaria, on the Main, is 15 miles NNW. of Würzburg; pop. 3000.

Carlstadt (properly, **ANDREAS RUDOLF BODENSTEIN**), reformer, born prior to 1483 at Carlstadt in Bavaria, joined Luther, who in 1521 was compelled to rebuke his iconoclastic zeal, and whom he afterwards opposed on the question of the Eucharist. Accused of participation in the Peasants' War (q.v.) and other intrigues, he fled to Switzerland, and became professor of Theology at Basel, where he died, 25th December 1541.

Carlton Club, the famous Conservative club (see CLUB), was so named as being near the site of Carlton House, built by Lord Carlton in 1709. Carlton House was the residence of Frederick, Prince of Wales (father of George III.), and of George IV. when Prince of Wales. It was pulled down in 1826.

Carludovica. See CYCLANTHACEÆ.

Carlisle, a town of Lanarkshire, near the Clyde, 19 miles SE. of Glasgow. The neighbourhood is rich in coal, iron, and limestone. Mining, fruit-growing, and jam-making are its chief industries.

Carlyle, **ALEXANDER**, of Inveresk, was born 26th January 1722 in Dumfriesshire, but brought up at Prestonpans, where his father was appointed minister. Educated at Edinburgh, Glasgow, and Leyden, he was ordained in 1748 minister of Inveresk, and here he remained till his death, 25th August 1805. With Robertson, the historian, he helped to lead the moderate party in the Church of Scotland; and he enjoyed in succession the highest honours of his profession, being occasionally sent to London as the accredited agent of his church, appointed Moderator of the General Assembly in 1770, and Dean of the Chapel-royal in 1789. His imposing presence earned him the popular name of 'Jupiter Carlyle'; 'he was,' says Sir Walter Scott, 'the grandest demigod I ever saw.' Throughout his long lifetime he enjoyed the intimate friendship of some of the most notable men of his time, as Hume, Adam Smith, Smollett, John Home, and many others on both sides of the Tweed; while he had seen and even shared in events as striking as the Porteous Mob and the government rout at Prestonpans. Hence the unique interest of his *Autobiography*, which was not begun till he had reached his seventy-ninth year, and comes down only to 1770, when he was but forty-eight. It was not published till 1860, when it was edited, and completed with a supplementary

chapter by Hill Burton (new ed. with portraits, 1910). Keen observation, perfect sincerity, and a not unkindly sarcasm combine to give the book a charm of a quite singular character, and indeed there are few books that can be compared with it as an intimate picture of the social habits of a bygone age. Its author unconsciously reveals himself a man of singularly genial, sagacious, and liberal nature, none the less a sincere Christian that he had a sound relish for claret, whist, play-going, and all the honest good things of life.

Carlyle. THOMAS, was born 4th December 1795, at Ecclefechan, in the parish of Hoddam, Annandale, Dumfriesshire—a small Scottish market-town, the 'Entepfuhl' of *Sartor Resartus*, 6 miles inland from the Solway, and about 16 by road from Carlisle. He was the second son of James Carlyle, stonemason (1758–1832); but his first son by his second wife, Margaret Aitken (1771–1853). James Carlyle, who came of a family which, although in humble circumstances, was an offshoot of a Border clan, was a man of great physical and moral strength, of fearless independence, and of, in his son's opinion, 'a natural faculty' equal to that of Burns; and Margaret Aitken was 'a woman of the fairest descent, that of the pious, the just, and the wise.' Frugal, abstemious, prudent, though not niggardly, James Carlyle was prosperous according to the times, the conditions of his trade, and the standard of Ecclefechan. He was able, therefore, to give such of his sons (he had a family of ten children in all, five sons and five daughters) as showed an aptitude for culture an excellent Scottish education. Thomas seems to have been taught his letters and elementary reading by his mother, and arithmetic by his father. His home-teaching was supplemented by attendance at the Ecclefechan school, where he was 'reported complete in English' at about seven, made satisfactory progress in arithmetic, and took to Latin with enthusiasm. Thence he proceeded in 1805 to Annan Academy, where he learned to read Latin and French fluently, 'some geometry, algebra, arithmetic thoroughly well, vague outlines of geography, Greek to the extent of the alphabet mainly.' His first two years at Annan Academy were among the most miserable in his life, from his being bullied by some of his fellow-pupils, whom he describes as 'coarse, unguided, tyrannous cubs.' But he 'revolted against them and gave them shake for shake.' In his third year, Carlyle had his first glimpse of Edward Irving, who was five years his senior, and had been a pupil at Annan Academy, but was then attending classes at Edinburgh University. In November 1809 Carlyle himself entered that university—travelling on foot all the way, a hundred miles, between Ecclefechan and the Scottish capital. Except in one department, Carlyle's college curriculum was not remarkable. In 'the classical field' he describes himself 'truly as nothing,' and learned to read Homer in the original with difficulty. He preferred Homer and Æschylus to all other classical authors, found Tacitus and Virgil 'really interesting,' Horace 'egotistical, *leichtfertig*,' and Cicero 'a windy person and a weariness.' Nor did he take much to metaphysics or moral philosophy. In geometry, however, he excelled, perhaps because Professor (subsequently Sir John) Leslie 'alone of my professors had some genius in his business, and awoke a certain enthusiasm in me.' But even in the mathematical class he took no prize.

In 1813 Carlyle's attendance at the Arts course in Edinburgh University came to an end, and he began formal though fitful preparation for the ministry of the Church of Scotland by enrolling

himself, on 16th November of the same year, as a student at its Divinity Hall. In the summer of 1814 he competed successfully at Dumfries for the mathematical mastership of Annan Academy. The post was worth only between £60 and £70 a year; but it enabled Carlyle, who was as frugal as his parents, to relieve his father of the expense of his support and to save a few pounds. Meanwhile he read widely, and wrote of his reading at great length, and with considerable power of satiric characterisation, to some of his college friends. But he found himself 'abundantly lonesome, uncomfortable, and out of place' in Annan, and from the first disliked teaching; while his 'sentiments on the clerical profession' were 'mostly of the unfavourable kind.'

In 1816 Carlyle accepted the post of assistant to the teacher of the parish (or grammar) school of Kirkcaldy, with 'an emolument rated about a hundred a year,' and all actual scholastic duties to perform. This change brought him into intimate relations with Edward Irving, who, having acquired a reputation as a teacher in Haddington, had been induced by the patrons of an adventure school in Kirkcaldy to undertake the management of it. The two, though professionally rivals, became fast friends, and read and made excursions into different parts of Scotland together. Carlyle was also introduced by Irving to various Kirkcaldy families, including that of Mr Martin, the parish minister, one of whose daughters his friend subsequently married. He himself became attached to an ex-pupil of Irving's, a Miss Margaret Gordon, with some of whose graces he afterwards endowed the dark and fickle Blumine of *Sartor Resartus*. She reciprocated Carlyle's affection, but the aunt with whom she lived put a stop to some talk of an engagement.

Carlyle found the people of Kirkcaldy more to his mind than those of Annan; but in two years the work of teaching became altogether intolerable to him, although he did it conscientiously. Successful opposition sprung up to Irving and himself, moreover, in the shape of a third school. Irving resolved to leave Kirkcaldy, and, in September 1818, Carlyle wrote to his father, who had now given up business in Ecclefechan and taken the farm of Mainhill, about two miles distant, that, having saved about £70, he purposed removing to Edinburgh, where he thought he 'could, perhaps, find private teaching to support him, till he could fall into some other way of doing.' He had now totally abandoned all thoughts of entering the ministry.

Carlyle removed to Edinburgh in November 1818. His prospects were for some time dubious; he even entertained the idea of emigrating to America. Ultimately, however, he obtained fairly regular and well-paid private teaching. An introduction to Dr (afterwards Sir David) Brewster, the editor of the *Edinburgh Encyclopedia*, led to his writing articles, chiefly biographical and geographical, for that work, at 'bread-and-butter wages,' and subsequently to his translating Legendre's *Elements of Geometry* from the French for £50. At the beginning of the session of 1819, he enrolled in the class of Scots Law, with the intention of becoming an advocate. But he found law as uncongenial a study as divinity. Till 1822 he lived in various lodgings in Edinburgh, finding his chief relief from tutorial drudgery in visits to his parents in Dumfriesshire. His health, which had suffered from too close application to study, was at times 'most miserable;' he 'was in a low fever for two weeks,' was harassed by sleeplessness, and began to be tortured by his life-long foe, dyspepsia. At the same time his mind was perplexed with doubt on religious matters, regarding which he seems to

have unburdened himself solely to Irving, who was then assistant to Dr Chalmers in Glasgow. For a period he was 'totally irreligious.' This struggle terminated in June 1821, 'all at once,' and when he was walking along Leith Walk (the Rue St Thomas de L'Enfer of *Sartor Resartus*), in what he regarded as his 'spiritual new birth.' He was now absorbed in German literature, especially the writings of Schiller and Goethe. The latter, indeed, had a more abiding influence on him than any other author.

In June 1821 also occurred his introduction, through Irving, to Miss Jane Baillie Welsh (1801-66), only daughter of Dr John Welsh, medical practitioner in Haddington, who had died two years before, leaving his daughter sole heiress of the small estate of Craigenputtock, 16 miles from the town of Dumfries. Miss Welsh, who was descended through her father from John Knox, was then living in Haddington with her mother, who claimed kindred with the patriot Wallace, and, according to Carlyle, 'narrowly missed being a woman of genius.' Miss Welsh had been the private pupil of Irving when he was a teacher in Haddington, and the result of the acquaintance thus brought about was a passionate attachment. They would, indeed, have been married, but for Irving's engagement to Miss Martin. The introduction of Carlyle to Miss Welsh, then twenty years of age, led to a correspondence between them on literary matters. After a time Carlyle attempted to adopt the tone of a lover. This, however, she peremptorily forbade, although she refused other suitors.

Early in 1822 Irving, who was on the point of entering on the pastorate of the Caledonian Chapel in Hatton Garden, London, recommended Carlyle as tutor to the three sons of Mr Buller, a retired Anglo-Indian. The salary offered was £200 a year. Carlyle, who had previously declined the editorship of a Dundee newspaper, accepted the offer; and two of the three, Charles Buller (q.v.) and Arthur, came to Edinburgh in the spring, to be under his care, while attending classes at the university. Carlyle found his duties pleasant, and was now able to give substantial pecuniary aid to his family, particularly as regarded the education of his younger brother John (1801-79), who subsequently became a physician, but is better known as the translator of Dante's *Inferno* (1849). Carlyle, after contemplating a history of the British Commonwealth, and a novel in association with Miss Welsh, arranged to write a *Life of Schiller* for Mr Taylor, the proprietor of the *London Magazine*, and a translation of the *Wilhelm Meister* of Goethe for Mr Boyd, an Edinburgh publisher. These two enterprises fully occupied his leisure while he was engaged as a tutor to the Bullers, whose parents, after spending the winter of 1822 in Edinburgh, removed in the following spring to Kinnaird House, near Dunkeld, on the Tay.

Carlyle paid his first visit to London in June 1824, whither the Bullers had gone, and, although his engagement with them was abruptly broken off, he remained there till March 1825, superintending the publication in book-form of his *Life of Schiller*. At this time he received the first of a series of letters from Goethe, and made the acquaintance of Coleridge, Thomas Campbell, Allan Cunningham, Procter, and other literary notabilities. On March 26, 1825, he removed to the farm of Hoddam Hill, about two miles from Mainhill, which he had leased, his brother Alexander doing the practical work of farming, while he himself translated German romances. Miss Welsh now consented to become his wife, after a lengthened correspondence. In 1826 he quarrelled with his landlord; his father gave up his farm; and both removed to Scotsbrig, another farm in the vicinity

of Ecclefechan. The marriage between Carlyle and Miss Welsh took place on 17th October 1826, at her grandfather's house at Templand, Dumfriesshire, and they at once settled in 21 Comely Bank, Edinburgh. Here Carlyle completed four volumes of translations from Tieck, Musæus, and Richter, which were published under the title of *German Romance*, and commenced a didactic novel, but burned his manuscript. An introduction from Procter to Jeffrey led to his becoming a contributor to the *Edinburgh Review*, his first article, on Jean Paul Richter, appearing in June 1827. The same year, he failed in his candidature for the chair of Moral Philosophy in the university of St Andrews in succession to Dr Chalmers. Various subsequent attempts to obtain an academic position for Carlyle met with no better success.

In May 1828 the Carlyles removed to Mrs Carlyle's little property of Craigenputtock, which, in a letter to Goethe he described as 'the loneliest nook in Britain, six miles removed from any one likely to visit me,' and there they lived for about six years. Carlyle subsisted during this period by writing for a number of Reviews, including the *Edinburgh*, the *Westminster*, the *Foreign Quarterly*, and *Fraser's Magazine*. The chief of the essays which he produced at Craigenputtock are those on Burns, Samuel Johnson, Goethe, Voltaire, Diderot, and Schiller. He also wrote a *History of German Literature*, the best parts of which were subsequently published in the form of essays; and in 1833-34 there appeared by instalments in *Fraser's Magazine*, *Sartor Resartus*, his most characteristic work, the fantastic hero of which, Diogenes Teufelsdröckh, illustrates in his life and opinions the mystical and grotesque 'Philosophy of Clothes.' *Sartor Resartus* is notable in the literary history of Carlyle as revealing the Germanisation of his mind, and his abandonment of the comparatively simple diction of his earlier essays for the thoroughly individual style of his later works—eruptive, ejaculatory, but always powerful, and often rising to an epic sublimity. Life at Craigenputtock was varied on the part of Carlyle by occasional visits to Edinburgh, in one of which the idea of writing his *French Revolution* occurred to him, by a residence of six months in London, during which he made the acquaintance of John Stuart Mill and John Sterling, and by visits from old friends like Jeffrey and new admirers like Emerson. In 1830 Carlyle was reduced to great straits; and he had to borrow £50 from Jeffrey for the expenses of his journey to London, although he declined to accept an annuity of £100 from the same source.

Having by 1834 again saved £200, Carlyle resolved to try his fortune in London, and on June 10 established himself in the house, 5 Cheyne Row, Chelsea, in which he lived till the day of his death. Here he settled down to the writing of his *French Revolution*, which appeared in 1837. This enterprise was almost put an end to in 1835, owing to the destruction, by a servant girl, of all but four or five leaves of the manuscript of the first volume, which had been lent to John Stuart Mill. Carlyle accepted £100 from Mill as compensation for his loss.

In the years 1837, 1838, 1839, and 1840, Carlyle lectured to considerable yet select audiences on 'German Literature,' 'The Successive Periods of European Culture,' 'The Revolutions of Modern Europe,' and 'Heroes, Hero-worship, and the Heroic in History.' Carlyle's yearly earnings from these lectures, the last series of which has been published, varied between £135 and £300, and maintained him and his wife till the *French Revolution* not only established his reputation as a literary genius of the highest order, and as in Goethe's phrase 'a new moral force,' but placed him beyond the possibility of want. Yet, until

late in life, his annual income from literature was not more than £400. In 1838 appeared *Sartor Resartus* in book-form, and the first edition of his *Miscellanies*. The following year Carlyle, who at one time was not averse to the idea of becoming a personal force in politics, published the first of a series of attacks on the shams and corruptions of modern society under the title of *Chartism*. This he followed in 1843 with *Past and Present*, and in 1850 with *Latter-day Pamphlets*, which proved among other things that, if he did not quite approve of slavery, he disapproved of the manner in which it had been abolished in the British dominions. In 1845 appeared *Cromwell's Letters and Speeches*, perhaps the most successful of all his works, inasmuch as it completely revolutionised the public estimate of its subject. In 1851 he published a biography of his friend John Sterling. From this time Carlyle gave himself up entirely to his largest work, *The History of Friedrich II. commonly called Frederick the Great*, the first two volumes of which were published in 1858, and which was concluded in 1865. The preparation of this book led Carlyle to make two excursions to the Continent, which, with a yachting trip to Ostend, two tours in Ireland (on which he intended to write a book based on a diary that was published after his death), and regular visits to his kindred and friends in Scotland, formed the chief distractions from his literary labours. Among the few public movements with which Carlyle identified himself was that which resulted in the establishment of the London Library in 1839. In August 1866 he also allowed himself to be elected chairman of the committee for the defence of Mr Eyre, who had been recalled from his post of Governor of Jamaica on the ground of his having shown unnecessary severity in suppressing a negro insurrection which had broken out in October of the previous year, or as Carlyle put it, for having 'saved the West Indies and hanged one incendiary mulatto, well worth the gallows.'

On November 11, 1865, Carlyle was elected Lord Rector of Edinburgh University by a majority of 657 votes over 310 recorded for Mr Disraeli. On April 2, 1866, the ceremony of his installation took place amidst extraordinary demonstrations of enthusiasm, when he delivered an address in which he embodied his moral experiences in the form of advices to the younger members of his audience. The success attending this visit to Edinburgh was quite obliterated by the news which reached him in Dumfries of the death, on April 21, of Mrs Carlyle, as she was driving in her carriage in Hyde Park. Carlyle's grief developed into remorse when he discovered from certain of her letters, and from a journal which she kept, that during a period of their married life his irritability of temper and unconscious want of consideration for her wishes had caused her much misery and even ill-health, which she studiously concealed from him. It has also been demonstrated by the *Letters and Memorials of Jane Welsh Carlyle* that in the years 1855 and 1856 they were somewhat estranged, owing to Carlyle's liking for the society of Harriet, Lady Ashburton. After the death of Lady Ashburton there were no differences between them, except such as might be expected in the case of two persons of irritable and high-strung natures, and of uncompromising veracity. These *Memorials* are also of note as proving Mrs Carlyle to have been one of the keenest critics, most brilliant letter-writers, and most accomplished women, of her time.

Carlyle wrote no important work after his wife's death, although after a visit to Mentone in 1867, where he partially composed his personal *Reminiscences*, he settled down to his old life in London.

In August 1867 there appeared in *Macmillan's Magazine* his view of British democracy, under the title of 'Shooting Niagara.' He prepared a special edition of his collected works, and added to them in 1875 a fresh volume containing 'The Early Kings of Norway' and an 'Essay on the Portraits of John Knox.' On November 18, 1870, he wrote a letter to the *Times* on the Franco-German Question, defending the attitude of Germany. He expressed privately strong opposition to the Irish policy of Mr Gladstone. In February 1874 he was offered and accepted the Prussian Order of Merit in recognition of his having written the life of Frederick the Great, who founded the Order. Towards the end of the same year Mr Disraeli offered him the Grand Cross of the Bath (with the alternative of a baronetcy) and a pension of 'an amount equal to a good fellowship,' but he declined both.

His eightieth birthday, December 4, 1875, brought Carlyle many tributes of respect, including a gold medal from a number of Scottish admirers, and 'a noble and most unexpected' note from Prince Bismarck. On May 5, 1877, he published a short letter in the *Times*, referring to a rumour that Mr Disraeli, as Premier, meditated forcing on a 'Philoturk war against Russia,' and protesting against any such design. This was his last public act. On the 5th February 1881 he died at his house in Chelsea. A burial in Westminster Abbey was offered; but, in accordance with his own wish, he was laid in the churchyard of Ecclefechan beside his kindred. His wife is buried beside her father in the ruined choir of the church of Haddington.

The time has not yet come for the passing of a final judgment on Carlyle's position in British literature. He was above all things a prophet, in the guise of a man of letters, who predicted the reverse of smooth things for his country and for the world; and it has yet to be seen if his predictions will be fulfilled. But it may be said even now, and without risk of contradiction, that, for good or evil, he exerted a greater influence on British literature during the middle of the nineteenth century, and, through that literature, on the ethical, religious, and political beliefs of his time, than any of his contemporaries; that, as a humorist, using humour seriously and as a weapon for the enforcement of his opinions, he has no superior, combining in himself what is best in Dunbar, Burns, Rabelais, and Swift; that as a master of the graphic in style he has no rival and no second—showing an equal facility in photographing nature and in grasping and presenting in appropriate phraseology the salient points of personal character as exhibited in expression, habits, features, build, and dress.

Of Carlyle, as a man, it is also permissible to say that, irritable, impatient, intolerant, fiercely proud, occasionally hasty in his judgments though he was, preserving to the last, nor caring to get rid of, certain Scottish and Annandale rusticities of manner and mental attitude, no one was ever more essentially self-controlled, patient, and humble than he, or ever faced the real misfortunes of life with a calmer courage; that he was as incapable of conscious injustice, unkindliness, or vindictiveness, as he was of insincerity or impurity; that in pecuniary straits, even in despair, he never wrote a line that he did not believe, never swerved by a hair's-breadth from the noble purposes which dominated his life and extinguished all selfish ambition.

The leading authorities on Carlyle are his collected works, of which various editions have been published: *Reminiscences of Thomas Carlyle* (two editions: Froude's and Norton's); Froude's *Thomas Carlyle, a History of the first forty years of his Life, 1795-1835* (published in 1882); the same author's *Thomas Carlyle, a History of his Life in London, 1834-81* (published in 1884); *Letters and Memorials of Jane Welsh Carlyle* (1883); *Corre-*

spondence between *Carlyle and Emerson*, edited by Charles Eliot Norton (1883); *Early Letters of Thomas Carlyle*, edited by C. E. Norton (1886; second series, 1888); and *Correspondence between Goethe and Carlyle*, edited by C. E. Norton (1887). There are books on Carlyle by Wylie and Moncreux Conway (1881), Masson (1885), Garnett (1887), Nichol (1892), Chesterton (1902), Craig (1908), and others; a bibliography of his works by Shepherd; a *Guide to Carlyle*, by A. Ralli (1920); Sir Gavan Duffy's *Conversations with Carlyle* (1892); the *Life of Mrs Carlyle* by Mrs Ireland (1891), and her *Letters* (1891, 1903). The question as to Froude's defects as a biographer was raised in Mr D. A. Wilson's *Froude and Carlyle* (1893); the question as to how far Froude was prejudiced by a false view as to the relations of Carlyle with his wife, expounded in Froude's posthumous work, *My Relations with Carlyle*, was sharply dealt with by Sir J. Crichton-Browne and Mr Alexander Carlyle in *The Nemesis of Carlyle* (1903), and Mr D. A. Wilson's *The Truth about Carlyle* (1913). There are annotated editions of the *French Revolution* (correcting Carlyle's slips) by J. H. Rose (1902) and C. R. L. Fletcher (1902), and of *Cromwell's Letters* by Mrs Lomas (1904).

Carmagnola, a town of north Italy, 18 miles S. of Turin by rail. The *condottiere*, Francesco di Bartolommeo Bussone, afterwards Conte di Carmagnola, was born here in 1390. Pop. 5000.

Carmagnole, the name of a popular song and dance of the French Revolution, every verse of which ended with the refrain: 'Dansons la Carmagnole—vive le son du canon !'

Carman, WILLIAM BLISS, born at Fredericton, New Brunswick, in 1861, studied at New Brunswick, Edinburgh, and Harvard universities, and became an engineer, a teacher, and literary editor of the *New York Independent* (1890-92). His *Low Tide on Grand Pré* (1893) has been followed by many other volumes of verse, including *Songs from Vagabondia* (in collaboration with Richard Hovey, 1894-1909), *Echoes from Vagabondia* (1912), *April Airs* (1916).

Carmania. See KERMAN.

Carmarthen (Welsh *Caer Fyrddyn*), the capital of Carmarthenshire, on the right bank of the Towy, in a picturesque situation. The 'winding Towy, Merlin's fabled haunt,' is navigable for vessels of 200 tons up to the town, which is 9 miles from Carmarthen Bay. Steele is buried in the old parish church; a ruined castle of the Welsh princes was in 1787 incorporated in a new county jail; Generals Picton and Nott, both natives, are commemorated by an obelisk and a bronze statue; a lunatic asylum (1863) and training-college (1847) may also be noticed. Near the town are tin and iron works; and Carmarthen exports tin-plates, slates, domestic produce, &c. Pop. 10,000.

Carmarthenshire, a maritime county of South Wales, washed on the S. by Carmarthen Bay, a semicircular inlet of the Bristol Channel, and bounded on the other sides by Pembroke, Cardigan, Brecknock, and Glamorgan shires. The largest of all the Welsh counties, it has a maximum length and breadth of 45½ and 26 miles, and an area of 947 sq. m., of which 70·8 per cent. is under cultivation. The county is mountainous in the north and east, and is characterised by productive though narrow valleys and deep, wooded glens; Carmarthen Van or Beacon (2596 feet) is the highest summit. The coast is marshy; the chief river is the Towy, which has a course of 65 miles, five-sixths in Carmarthenshire. It yields plenty of salmon, trout, eels, and lamprey, and is navigable for the last 9 miles of its course. On this river is the celebrated vale of the Towy, 30 miles long, with an average breadth of 2 miles. Carmarthenshire, north and west of the Towy, comprising three-fourths of the county, consists of Lower Silurian clay-slate and graywacke. In the

south-east corner of the county is a band of carboniferous limestone and grit, to which succeeds a small part of the great South Welsh coal-field, chiefly composed of stone-coal and culm. The mineral productions of the county are iron, coal, copper, lead, slates, lime, dark-blue marble. These, with tinned iron, grain, cattle, horses, sheep, and butter, are exported. The climate is mild, but moist; the soil is stiff and poor in the uplands, affording pasturage for small cattle; but the rest of the county is well wooded, and in the south part along the rivers very fertile. Agriculture is rather backward, the chief crops are oats and barley. The principal towns are Carmarthen (the county town), Llanelly, Llandilo-vawr, Llandovery, and Newcastle-Emlyn. The chief manufactures are woollens and leather. Pop. (1801) 67,317; (1841) 106,326; (1921) 175,069, largely Welsh-speaking. Carmarthenshire sends one member to parliament for each of its Carmarthen and Llanelly divisions. Traversed by the old Roman Julian way, the county contains several so-called Druidical remains, the ruins of Dynevor and Carregcennin castles, and remains of four religious houses. It was the birthplace of the 'Rebecca' Riots (q.v.), directed in 1843-44 against the turnpike-gates.

Carmathians. See KARMATHIANS.

Carmaux, a great coal-mining centre in the French dep. of Tarn, 9 miles N.E. of Albi by rail. Serious strikes and riots took place here in 1892. Pop. 10,000.

Carmel is a limestone-ridge which runs from SE. to NW. for 14 miles, forming the only great promontory on the low coast of Palestine. It attains a height of 1749 feet. On the east are the river Kishon and the Plain of Esdraelon. The name Carmel signifies 'orchard,' and the well-watered mountain is still richly clad with pine and holm-oak trees, and in its lower parts with olive, walnut, and bay trees, and a great variety of plants and flowers. Mount Carmel, the scene of Elijah's sacrifice, is renowned in Jewish history, and is often alluded to in the imagery of the prophets. On its north-west point, which rises 500 feet above the sea, there is a monastery, the monks in which are Carmelites (q.v.). The mountain's usual modern name, *Mar Elias*, indicates its connection in the popular mind with the life of the great prophet.

Carmelites, or ORDER OF OUR LADY OF MOUNT CARMEL, a monastic order founded as an association of hermits on Mount Carmel by Berthold, a pilgrim or crusader from Calabria about 1156. A legend, however, ascribes the foundation of the order to the prophet Elijah; and another makes the Virgin Mary to have been a Carmelite nun. They received the rule of their order from the patriarch Albert of Jerusalem in 1209, and it was confirmed by Pope Honorius III. in 1224. Driven out by the Saracens, they settled first in Cyprus (1238), then in various parts of Western and Southern Europe, and at their first general chapter held at Aylesford in England in 1245, they elected as their head Simon Stock, under whom they were changed into a mendicant order by Pope Innocent IV. in 1247. From that time they shared in the usual vices of the mendicant orders. They subsequently divided into several branches, more or less rigid in their rules, one distinguished by walking barefooted (*discalced*). They were called White Friars from the cloak of their habit; their scapulary was of gray cloth. In 1880, 176 Carmelites were banished from France. On the English Discalced Carmelites, see *Carmel in England* (1899), by Zimmermann. The order of *Carmelites*, or *Carmelite Nuns*, was instituted by the Carmelite general Soreth in 1452, and is very numerous in Italy. It played a considerable

part in France in the 18th century, and counted among its members La Vallière and the daughter of Louis XV.

Carmen Sylva, the pen name of Elizabeth (1843-1916), queen of Rumania, the daughter of Prince Hermann of Wied Neuwied, and Maria of Nassau. She married King (then Prince) Charles of Rumania in 1869. Her only child, a daughter, died in 1874, and out of this great sorrow arose her literary activity. Two poems, printed privately at Leipzig in 1880 under the name 'Carmen Sylva,' were followed by *Stürme* (Bonn, 1881), *Leidens Erdengang* (Berlin, 1882; translated into English as *Pilgrim Sorrow* by Helen Zimmern, 1884), *Jehovah* (Leip. 1882), *Ein Gebet* (Berlin, 1882), &c.—in all nineteen volumes of German verse and one of English, besides novels and other works. Many of the translations in *Rumänische Dichtungen* (Leip. 1881) are hers. In *Pelesch-Märchen* (Leip. 1883) she worked into literary form many native traditions of her adopted country. In the war of 1877-78, as *muma rântilor* ('mother of the wounded'), she endeared herself to her people by her devotion to the wounded; and she fostered national women's industries. See *Life* by Baroness Deichmann (Eng. trans. 1890).

Carminatives, medicines to relieve flatulence and pain in the bowels, such as cardamoms, pepper-mint, ginger, and other stimulating aromatics.

Carmine (Arabic *Kermes*) is the red colouring principle obtained from the cochineal insect (see COCHINEAL). The method by which it is prepared is said to have been accidentally discovered by a Franciscan monk at Pisa, while compounding a medicine containing cochineal; and in 1656 its manufacture was begun. There are several processes by which carmine may be prepared, all of which in effect depend on exhausting powdered cochineal with boiling water, and precipitating the pigment by the addition of a weak acid or an acid salt. The following is an example of the processes: Digest 1 lb. of cochineal in 3 gallons of water for 15 minutes, then add 1 oz. of cream of tartar, heat gently for 10 minutes, add $\frac{1}{2}$ oz. of alum, boil for 2 or 3 minutes, and after allowing impurities to settle, the clear liquid is placed in clean glass pans, when the carmine slowly separates and deposits. After sufficient time the liquid is drained off, and the pigment is dried in the shade. It is alleged that bright sunny weather is essential to the production of the finest qualities. Hence it is said the United Kingdom is unfavourably situated for the manufacture; but the fact is that details of successful processes are guarded with jealous care; and in all probability brightness and purity of product are due to important minor details in the manufacturing process. Carmine is soluble in water, weak spirit, and in ammoniacal solutions; the latter agent affording a ready means of detecting the presence of the adulterants—chalk, China clay, and vermilion—frequently added to the costly pigment. Carmine is a most beautiful pinky red, sometimes used for silk and wool dyeing, but more sought for colouring fine confections, and dyeing feathers and artificial flowers; and it is not unknown as cosmetic rouge. Carmine Lake, prepared with alumina, is a most important artist's colour. There are various other tinctorial agents known under the name of carmine, of which the commonest are Archil Carmine made from Archil (q.v.); Brilliant Carmine Red, a lake of Brazil-wood; Indigo Carmine, a purple preparation of indigo, and Sorgho Carmine, obtained from the juice of the sugar or Chinese Sorghum, *Sorghum Saccharatum*.

Carmo'na, a town of Andalusia, Spain, 27 miles ENE. of Seville by rail, is picturesquely situated, and commands an imposing view of the valley

of the Guadalquivir. Julius Cæsar speaks of *Carmo* or *Carmona* as 'by far the strongest city of the whole province of further Spain.' Recent important excavations on the site of the ancient necropolis, to the west of the modern town, have brought to light a large number of tombs and funeral triclinia in almost perfect preservation. Considerable portions of the Moorish wall and Alcazar still remain. Pop. 21,500.

Carnac, a village in the French department of Morbihan, 20 miles SE. of Lorient. It is remarkable on account of the number and variety of prehistoric and Gallo-Roman remains, consisting of menhirs, Dolmens (q.v.), and tumuli, with which the neighbourhood is studded. The principal group of menhirs is situated on a sterile moor near the seashore, and consists of 2700 or more rude monoliths of granite, resting with their smaller ends in the ground, rising, many of them, to a height of 18 feet, though a large proportion do not exceed 3 feet. They are arranged in 10 to 13 rows, about $\frac{1}{2}$ mile from east to west, but not quite alike in orientation, and have at one end a curved row of 18 stones, the extremities of which touch the outer horizontal rows. The object of the monument, in many ways mysterious, may have been commemorative. Smaller monuments of the same character as the great one at Carnac are found to the west of it at Erdeven and St Barbe. The Bossenno, a group of mounds, about $\frac{1}{2}$ miles from Carnac, otherwise called 'Cæsar's Camp,' contains the principal Roman remains, and was first explored systematically by Mr Miln (1874-80). The result was the discovery of buildings giving evidence of the existence of a Gallo-Roman settlement at the Bossenno. Numerous remains were found consisting chiefly of pottery (some of it very fine), tiles, bronze and iron objects, fine glass ware, Roman coins, statuary, and food refuse. While most of the pottery is evidently of Gaulish and Roman origin, many of the bronze ornaments are of Celtic type, and the coins all Roman, with dates from 200 to 353 A.D. The houses had evidently been destroyed by fire, but no human remains were found. See *STANDING STONES*, Miln's *Excavations at Carnac* (2 vols. 1877-81), and Worsfold's *French Stonehenge*. For Karnak in Egypt, see THEBES.

Carnahuba, or CARANAIBA PALM (*Copernicia cerifera*), a very beautiful and useful palm, which abounds in the northern parts of Brazil, in some places, particularly river-banks, forming vast forests. It attains a height of only 20 to 40 feet, but its timber is put to many uses, and is even fine enough for veneering. The olive-like fruit is eaten, and the seeds are roasted as a substitute for coffee; the terminal bud yields a palm-cabbage, and the pith a kind of sago; while the leaves are used in thatching, mat-making, &c. Like *Ceroxylon andicola*, this tree is also an important source of palm-wax; this substance exudes in scales from the under sides of the cut leaves, and drops off when these are dried and shaken. This wax is melted into masses, and beeswax is often adulterated with it. It has been used in the manufacture of candles. See PALM, WAX.

Carnallite, a mineral consisting of chloride of potassium and magnesium ($\text{KCl.MgCl}_2.6\text{H}_2\text{O}$), used as a source of magnesium.

Carnarvon, HENRY HOWARD MOLYNEUX HERBERT, EARL OF, born in 1831, from Eton passed to Christ Church, Oxford, where in 1852 he took a first-class in classics. He had succeeded his father as fourth earl in 1849, so now entered the Upper House as a Conservative, and in 1866 accepted from Lord Derby the office of Colonial Secretary. As such he had moved the second reading of an important bill for the confederation of the British North American colonies, when, with the

future Marquis of Salisbury, he resigned office upon the Reform Bill of 1867, which he regarded as democratic and dangerous. On Disraeli's return to power in 1874, Lord Carnarvon resumed office as Colonial Secretary, once more, however, to resign in January 1878 in consequence of the despatch of the British fleet to the Dardanelles. In 1885-86 he was Lord-lieutenant of Ireland, and his negotiations with Mr Parnell gave rise, two years later, to controversy. Carnarvon, who died 28th June 1890, was author of *The Druses of Mount Lebanon* (1860), *Reminiscences of Athens and the Morea* (1869), and translations of the *Agamemnon* (1879), the *Odyssey* (1886), and the *Prometheus Vincit* (1893).

Carnarvon (*Caer-yn-ar-Fon*, 'fort opposite Mon or Anglesey'), a parliamentary and municipal borough and seaport in North Wales, the capital of Carnarvonshire, stands near the south end of the Menai Strait, on the right bank of the Seiont, 69 miles W. of Chester. Carnarvon has a castle situated at the west end of the town, the building of which was commenced by Edward I. in 1283. It is one of the noblest ruins in the kingdom, the walls, which are 7 to 9 feet thick, being still entire, and inclosing an oblong of three acres. There are thirteen embattled towers, with five, six, or eight sides, and surmounted by turrets. The gateway under the great square tower has four portcullises. The town itself was once surrounded by walls and round towers. These walls, with several of the gates, still exist, but are now within the town. Carnarvon unites with Pwllheli, Nevin, Criccieth, Conway, Bangor, &c. in returning one member to parliament. The harbour admits ships of 400 tons. The chief exports are slates, stones, and ores. There are also iron and brass foundries. Carnarvon is a bathing-place, and is much frequented by tourists on account of its vicinity to the grandest scenery in North Wales, and its very convenient railway connections. Population, about 8000. Half a mile from Carnarvon are the remains, covering seven acres, of Segontium, or *Caer Seiont*, a Roman station or city. Gold, silver, and copper coins and ornaments, and other Roman relics, have been found here. There is a Roman fort on the left bank of the Seiont, still almost complete, with walls 11 feet high, and 6 feet thick. Carnarvon was the seat of the native princes of North Wales down to 873. In 1284 was born here the first Anglo-Norman Prince of Wales, afterwards the unhappy Edward II. In 1294 the town and castle were burned, and the English inhabitants massacred by the Welsh under Madoc, the illegitimate son of Llewelyn (see WALES). In 1910 Carnarvon witnessed the investiture of the Prince of Wales—the first time an English prince was invested within the principality.

Carnarvonshire, a maritime county of North Wales, bounded E. and SE. by Denbigh and Merioneth shires, and on all other sides by the Irish Sea and the Menai Strait. With a maximum length and breadth of 34 and 23 miles, it has an area of 379 sq. m., of which 50·7 per cent. is under cultivation. The surface is grandly mountainous, traversed by the highest ranges in South Britain. The chief of these runs right along the middle of the county, from south-west to north-east, and is very bold and rocky. It attains its maximum altitude in Snowdon (q.v.), 3571 feet, in the centre of the county, the loftiest summit south of the Scottish Border. Carnarvon Bay is 34 miles across, and 16 deep, with 2 to 30 fathoms water; it communicates with the Irish Sea through the Menai Strait, which is 14 miles long, and 200 yards to 2 miles broad. The rivers of Carnarvon are numerous, but small. The chief is the Conway, which is navigable for 10 miles, and runs along the east border. Almost

all the streams flow through small lakes or tarns—of which there are 50 or 60 in the county—around the central or Snowdon group of mountains. There are many fine cataracts on these streams. Igneous rocks almost everywhere intrude on the Lower Silurian and Cambrian beds; and the mineral products of Carnarvon include copper, lead, zinc, coal, roofing and writing slates. The Penrhyn slate-quarries employ many thousands of workmen. The chief towns are Carnarvon (the county town), Bangor, Pwllheli, Conway, Nevin, and Criccieth. In addition to the above boroughs, several flourishing towns and tourist centres have come into prominence—Llandudno, Tremadoc, Bethesda, Bettws-y-Coed, Llanberis, and Beddgelert. The county returned two members to parliament—one for the south or Efon division, and one for the north or Arfon division; since 1918 one only. Pop. (1801) 41,521; (1881) 119,349; (1921) 131,034. Carnarvon contains several hill-forts, stone-circles, two Roman stations, some ruined castles, and vestiges of monasteries. The Snowdonian mountains were long the stronghold of the Welsh against invasion by the Romans, English, and Normans, but here they were conquered by Edward I. in 1277-82.

Carnatic, a region on the east or Coromandel coast of India, now included in the province of Madras, extending inland to the Eastern Ghats, and lengthwise from Cape Comorin to 16° N. It extended for about 600 miles along the east coast, and from 50 to 100 miles inland. The name *Karnataka* was originally applied by its Mohammedan conquerors to Mysore and the country above the Ghats. In course of time the term was first extended, and then exclusively applied to the country below the Ghats. The Carnatic is no longer an administrative division, but is memorable as the theatre of the struggle of the 18th century between France and England for supremacy in India.

Carnation, one of the finest of florists' flowers, a double-flowering variety of the Clove Pink (*Dianthus caryophyllus*, see PINK), and existing only in a state of cultivation, of which, however, we have traditions as early as the 13th century. The taller *Tree Carnations* (*D. fruticosus*, usually reckoned a sub-species or variety of the preceding) are less esteemed by florists. 'Scarlet, purple, and pink are the prevailing colours; but whatever are the colours of a carnation, it is of no value in the eyes of a florist unless they are perfectly distinct. Fullness and perfect regularity are also deemed essential.' Despite this crude standard of selective taste, happily now developing towards a subtler and more refined appreciation of form and colour, the varieties are extremely numerous: those which have only one colour, disposed in large stripes through the white ground of the petals, are called *Flake Carnations*; those which have two or three shades of colour, also in stripes, *Bizarre Carnations*; and those which have the edge bordered with a different colour from the white or yellow ground are called *Picotees*; in these the limb is often spotted and the petals fringed. By French florists a different but equally arbitrary classification is adopted. Carnations are propagated in summer either by layers or by *pipings*, which are short cuttings of shoots that have not yet flowered, each having two joints.

Carneuba. See CARNAHUBA.

Carneades, a Greek philosopher, born at Cyrene, in Africa, about 213 B.C. He studied logic at Athens under Diogenes, but became a partisan of the Academy, and an enemy of the Stoics, whose stern and almost dogmatic ethics did not suit his sceptical predilections. He was in fact one of the most important of the ancient sceptics, and held that no criterion of truth exists

either in the senses or the understanding of man. He was founder of the Third or New Academy. As ambassador at Rome, in one oration he eulogised justice, and in a second proved that it did not exist. Cato moved that he be sent home as a corrupter of youth. He died at Athens in 129 B.C.

Carnegie, ANDREW (1835-1919), son of an owner of hand-loom, ruined by the power-loom, was born in Dunfermline, whence with his parents and younger brother he emigrated in 1848 to Pittsburgh in Pennsylvania. After tending a small engine, he was successively telegraph messenger and operator, railway clerk, and railway superintendent. Fortunate investments in oil were followed by the establishment of a rolling-mill, from which grew up the largest system of iron and steel works in the world, centred at Homestead near Pittsburgh. In 1898 he bought Skibo Castle on the Dornoch Firth, and subsequently withdrew from business with a fortune of as many millions as most rich men have thousands. Holding that 'he who dies rich dies disgraced,' Mr Carnegie, who never speculated, or bought or sold stocks, gave generously and on an unparalleled scale for public purposes, especially for libraries in Great Britain, the United States, and Canada—Pittsburgh, New York, Allegheny City, St Louis, Edinburgh, and Glasgow being amongst the largest recipients. In 1901 he made over to trustees £2,000,000 five per cent. bonds (giving an income of £104,000) for the better equipment of the Scottish universities in science, medicine, economics, history, English literature, modern languages, technical and commercial education; for the endowment of research; and for paying the university fees of students Scottish born or of Scottish extraction—any surplus income to go to support lectureships or evening classes. In the next year he founded the Carnegie Institution in Washington, and endowed it with a like sum, also for the promotion of research and education. Again, in 1905, he gave £2,000,000 to provide pensions for American university and college teachers. To the Carnegie Corporation of New York he gave about £25,000,000, with wide powers. His benefactions had at his death reached more than £70,000,000. They include large sums for the Pittsburgh Carnegie Institute, for the improvement of the city of Dunfermline, for church organs, for The Hague Palace of Peace, and for Hero Funds in Britain, America, and France. His reputation as an employer was not good. He wrote *Triumphant Democracy* (1886), *The Gospel of Wealth* (1901), *The Empire of Business* (1902), a Life of James Watt (1905), and an Autobiography (1920).

Carnelian, or CORNELIAN (Lat. *corneolus*, confused with *carneolus*, flesh-coloured), a fine kind of Chalcedony (q.v.), blood-red or reddish-white.

Carniola (Ger. *Krain*), formerly a south-west Austrian land, was in 1919 assigned mostly to Yugoslavia. A small part in the west (including Adelsberg and Idria) went to Italy. Most of the inhabitants are Slovenes, the remainder Germans and Croats. It is traversed in the north by a continuation of the Carinthian Alps, and in the south by the Julian Alps, the loftiest summit being the Terglou (9393 feet), between the two sources of the Save, which is the principal river. The scenery of the country abounds in interesting and singular features, amongst which are Lake Zirknitz (q.v.), and the rock-bridge of St Kanzian, 131 feet high, and 164 feet broad, with a perfect arch 65 feet high. Flax, silk, maize, honey, wine, and much fruit are produced. The chief minerals are iron and brown coal. Laibach (Slov. *Ljubljana*) is the capital. From 972 Carniola had margraves of its own; but in 1245 and 1364 it passed to the

Dukes of Austria. See three historical works by Dimitz (6 vols. Laibach, 1874-86).

Carnival (Ital. *Carnovale*; from late Lat. *carnelevamen*, 'a solace of the flesh'; incorrectly explained as if meaning 'farewell to flesh,' as in Byron's *Beppo*), a festival which originally began on the day following the feast of the Epiphany, and continued till midnight on Shrove-Tuesday. With Ash-Wednesday of course began the fast of Lent, which made an end of the preceding feasting, masquerading, and buffoonery. In later times, the Carnival was limited to the time of from three to eight days before Ash-Wednesday. Without doubt the forms and customs still preserved in the celebration of the Carnival originated in the heathen festivals of spring-time; and they still remind us partly of the Lupercalia and Bacchanalia of Southern Europe, and partly of the Yule-feast among northern peoples. Banquets of rich meats and drinking-bouts were the chief attractions of the Carnival during the middle ages. Shrovetide, or Shrove-Tuesday, called also Fasten-Even or Pancake-Tuesday, was a relic of the English Carnival, and formerly a season of extraordinary sport and feasting. The rich commenced the festive time at the feast of Epiphany, or on 'Three Kings' Day; but the middle classes restricted their days of revelry to the week immediately preceding Lent; while the poor indulged in only a few days of mad mirth. The several chief days of Carnival had distinct names, such as 'fat' or 'greasy Sunday,' 'blue Monday' (or 'fools' consecration'), &c. The Tuesday before the beginning of Lent was especially styled Carnival—the *Fasnacht* of the German people. In Germany it is celebrated in the cities of the Rhine provinces, but has even been revived in the austere north—in Leipzig, Hamburg, and Berlin. In most countries the celebration is confined to wearing of masks, processions in costume, and masked balls. In the south of France and throughout Italy, especially in the cities, it is still a popular festival of universal observance. Venice used to be pre-eminent for the splendour of its carnivals; at Rome races of riderless horses (*barberi*) along the crowded Corso were, till well into the 19th century, one of the chief items in its celebration. In many places flowers and plaster *confetti* are thrown from the windows and balconies on the occupants of the carriages and processional cars in the streets, with a return fire from below.

Carnivora, a well-defined order of Mammals more or less efficiently adapted for predaceous life, and including most of the forms popularly known as Beasts of Prey. It partly corresponds with the order *Feræ* defined by Linnæus, but the latter included also Marsupials and Insectivora. Not all animals carnivorous in diet are Carnivora in structure, for the Dasyure or Tasmanian Devil is a Marsupial, and the blood-sucking *Desmodus* is a bat. Nor are all the members of the order Carnivora in diet purely carnivorous, for the polar bears eat grass greedily, the rats are very partial to honey, and many forms eat fruits, berries, insects, molluscs, or crustaceans in a highly omnivorous manner.

General Characters.—The dentition of most Carnivora is very characteristic; there are in each jaw six pointed cutting teeth, two strong sharp recurved canines, and molar teeth often adapted for cutting. The skull is short and dense. The lower jaw works up and down in a deep transverse semi-cylindrical groove, and there are deep hollows on the sides and prominent crests on the roof of the skull for the reception and insertion of the powerful muscles which work the jaw. The toes are clawed, with more or less pointed nails almost always well developed.

As one would expect in animals with a vigorous life-experience, the convolutions of the brain and olfactory lobes are well developed. In contrast to herbivorous animals, the stomach is simple, and the



Skull of Tiger.

cæcum or blind process of the intestine is either absent or small. The placentation is deciduate and generally zonary. Carnivorous diet, vagrant predatory habit, fierce disposition, and high intelligence are familiarly characteristic.

Classification.—It becomes at once necessary to distinguish two sub-orders (*a*) the typical, terrestrial Carnivora (*Fissipedia*), and (*b*) the aberrant, aquatic forms (*Pinnipedia*), which may be thus contrasted:

FISSIPEDIA.	PINNIPEDIA.
Terrestrial, at most partially aquatic.	Aquatic, except at birth.
Special cutting back-tooth in each jaw.	Very uniform back-teeth.
Incisors almost always 3.	Always fewer.
Strong curved sharp claws.	Webbed feet.
First and fifth digits of hind-foot never longer than the others.	Outmost and inmost toes of hind-foot predominate in length and strength.

The second sub-order, with its numerous adaptive characters, has doubtless been derived from the first, and is divided into three families, with about fifty species: (1) *Otariidæ* (Sea-bears), nearest the typical Carnivores, (2) *Tricheidæ* (Walrus), and (3) *Phocidæ* (Seals). Some Tertiary fossil forms are known, but they are not nearer the typical Carnivores than those now existing.

Cuvier proposed to divide the typical carnivores into Plantigrades, walking on the entire sole—e.g. bears, and Digitigrades, walking on finger-tips—e.g. cats; but these physiological differences are rendered useless by the multitude of transitional links connecting them, and besides, as an accurate fact, the majority of Carnivores 'belong to neither one form nor the other, but may be called sub-plantigrade.' It is at once more accurate and useful to divide the typical Carnivores into three sections, represented familiarly by bear, dog, and cat, and technically known as *Arctoidea*, *Cynoidea*, *Æluroidæ*. The distinctions are based on certain features in the base of the skull, but are corroborated by other more general characteristics. There are about 300 living species.

(1) The *Arctoidea*, which are least specialised, and nearest the aquatic sub-order, include the following families: (*a*) *Mustelidæ*—e.g. Otter (*Lutra*), Sea-otter (*Enhydra*), Skunk (*Mephitis*), Sand-bear (*Arctonyx*), Badger (*Meles*, *Taxidea*), Ratel (*Mellivora*), Grison (*Galictis*), Marten and Sable (*Mustela*), Stoat or Ermine (*Putorius*), Glutton (*Gulo*), &c.; (*b*) *Procyonidæ*—e.g. Raccoon (*Procyon*), Coati (*Nasua*), Kinkajou (*Cerculeptes*); (*c*) *Ailuridæ*—e.g. Panda (*Ailurus*); (*d*) *Ursidæ*—e.g. Bear (*Ursus*).

(2) The *Cynoidea* (*q.v.*), occupying a median position, include numerous forms in two series represented by dog and fox.

(3) The *Æluroidæ*, comprising the most specialised carnivores, include four families: (*a*) *Felidæ*—e.g. Cat, Lion, Tiger, Jaguar, Cheetah (*Felis*); (*b*) *Viverridæ*—e.g. Civet (*Viverra*), Binturong (*Arctictis*), Ichneumon (*Herpestes*); (*c*) *Hyenidæ*—e.g. Aardwolf (*Proteles*), and Hyæna.

Pedigree and History.—The fossil history of Carnivora is of great interest, for not only have some remarkable forms like the sabre-toothed tiger (*Machairodus*, *q.v.*) been unearthed, but the various families are linked together, as the cats and civets by *Proviverra*, and the ancestors of at least the cats and the dogs are found in primitive generalised carnivores, such as *Miacis*, *Oxyæna*, and *Arctocyon*. The group affords beautiful illustration of increasing and of divergent specialisation as illustrated in the passage from primitive forms to the lion on the one hand and the seal on the other. As to the relation of the Carnivora to other orders of mammals, speculation is rife, but firmly based conclusions hard to find. Looking backward, some naturalists have discovered affinities with the marsupials, while others looking forward have with more abundant evidence regarded the primitive carnivores as ancestral to Insectivora, and through them to Cheiroptera. Some, again, find affinities between Cetacea and carnivores, though this is vigorously denied by other authorities. See Huxley, *Anatomy of Vertebrate Animals*; and Flower, *Osteology of Mammalia*.

Carnivorous Plants. See INSECTIVOROUS PLANTS, DIONÆA.

Carnot, LAZARE NICOLAS MARGUERITE, the 'organiser of victory' during the early wars of the French Revolution, was born at Nolay, Burgundy, in 1753. He entered the army as engineer. In 1791 he became a member of the Legislative Assembly, and in the Convention voted for the death of Louis XVI. During a mission to the army of the north, he took temporary command and gained the victory of Wattignies. On his return he was elected into the Committee of Public Safety and intrusted with the organisation of the armies of the Revolution, in that task displaying marvellous energy and ability. In a short time he raised fourteen armies, and drew up a plan of operations, by which the forces of the European reaction were repelled from the frontier. Though he endeavoured to restrict the power of Robespierre, he was accused, with others, after the Reign of Terror; but the charge was dismissed. Carnot was a member of the Directory at its institution in 1795, but in 1797, having opposed the extreme measures of Barras, his colleague, he was sentenced to deportation as a suspected royalist. He escaped into Germany, where he wrote his defence, which conduced to the overthrow of his colleagues in 1799. The 18th Brumaire brought him back to Paris, where he was made Minister of War, 1800; and by his energy, skill, and fertility of administrative resource, helped to achieve the brilliant results of the Italian and Rhenish campaigns. He retired, however, from his office when he understood the ambitious plans of the emperor, but hastened, when he witnessed the reverses of the empire, to offer his services to Napoleon, who gave him the command of Antwerp in 1814, which he heroically defended. During the Hundred Days he held office as Minister of the Interior; and after the second restoration retired first to Warsaw, and next to Magdeburg, where he died in 1823. Of his numerous writings on mathematics, military tactics, &c., the best is *Réflexions sur la Métaphysique du Calcul Infinitésimal* (1797).

See his *Mémoires* (2 vols. 1861-64), and the *Lives* of him by Arago (1850) and Picaud (1885).—His son, NICOLAS LEONARD SADI, founder of the science of thermo-dynamics, was born at Paris, 1st June 1796; studied at the Polytechnic, served in the engineers, and became captain; but died of cholera, 24th August 1832. His principal work is the *Réflexions sur la Puissance du Feu* (1824), (see THERMO-DYNAMICS).—Another son, LAZARE HIPPOLYTE CARNOT, born at St Omer, 6th April 1801, one of the leaders of the French democracy, was in early life a disciple of St Simon, but, like others, left that school on account of the lax morals advocated by *Enfantin*—protesting against 'the organisation of adultery'—and devoted himself to the inculcation of a more orthodox and virtuous socialism in various periodicals. After the February Revolution (1848) he was appointed Minister of Public Instruction, but soon resigned. In 1863 he entered the Corps Législatif, and the National Assembly in 1871. He was elected a senator for life in 1875, and died 16th March 1888. He wrote an *Exposé* of St Simonism and *Mémoires* of Henri Grégoire and of Barrère.—MARIE FRANÇOIS SADI CARNOT (1837-94), French President, was born at Limoges, the eldest son of the last named. He studied at the École Polytechnique, and was a civil engineer. In 1871 he was chosen to the National Assembly, and was finance minister in 1879, as also in 1887. Distinguished for integrity and moderation, he was in 1887 chosen President of the Republic, but was assassinated at Lyons by an anarchist.

Carnotite, a mineral composed of hydrated vanadate of uranium and potassium; a source of radium.

Carnoustie, a coast-town of Forfarshire, 11 miles ENE. of Dundee, with exceptionally fine golf-links; pop. 6000.

Carnuntum, a Celtic town of Pannonia, on the Danube, of naval, military, and commercial importance in Roman days. Only extensive ruins of the town, destroyed by the Magyars in the 9th century, now remain, near Hainburg, Lower Austria.

Caro, ANNIBALE, Italian author and poet, born at Cittanuova in Ancona, 1507, lived as secretary with a succession of cardinals, and died at Rome in 1566. Only two humorous works appeared during his lifetime; the rest of his writings, including the *Rime*, a translation of the *Æneid*, a play, and four series of letters, have been most of them often republished, and, from their elegant style and masterly handling of Tuscan, are still esteemed classics.

Caro, ELME MARIE, a French philosopher, was born at Poitiers, March 4, 1826. After studies at the École Normale of Paris, and at Angers and Douai, he became in 1857 a lecturer at the École Normale, ten years later professor at the Sorbonne. In 1874 he was elected to the French Academy. He died 13th July 1887. His Wednesday lectures at the Sorbonne were exceedingly popular, and were never too difficult for the fashionable ladies who thronged to hear them. Pailleron made 'le philosophe des dames' the butt of his clever raillery in his well-known comedy *Le Monde où l'on s'ennuie*. Caro's chief works are *Le Mysticisme au XVIII. Siècle* (1852-54), *L'Idée de Dieu et ses nouvelles Critiques* (1864), *Le Matérialisme et la Science* (1868), *Le Pessimisme au XIX. Siècle* (1878), *La Philosophie de Goethe* (2d ed. 1880), *George Sand* in 'Les Grands Écrivains Français,' and *Mélanges et Portraits* (1888).

Carob, ALGAROA, or LOCUST-TREE (*Ceratonia siliqua*), a tree of the order Leguminosæ, sub-order Cæsalpinieæ, a native of the Mediterranean countries. In size and manner of growth it some-

what resembles the apple-tree, but with abruptly pinnate dark evergreen leaves, which have two or three pair of large oval leaflets. The flowers are destitute of corolla; the fruit is a brown leathery pod, 4 to 8 inches long, a little curved, and containing a fleshy and at last spongy and mealy pulp, of an agreeable sweet taste, in which lie a number of shining brown seeds, somewhat resembling small flattened beans. The seeds are bitter and of no



Branch of Carob.

value; they were formerly used as weights by jewellers; and *Carat* (q.v.) may come from *kera-tion*, a Greek name for them. The pods are an important article of food to the poorer classes of the countries in which the tree grows. In Cyprus, &c., they are even pressed for their sugar, the residue being given with fodder. They are much used by the Moors and Arabs. They are also valuable as food for horses and cattle, for which they are much employed in the south of Europe, and are also imported into Britain under the name of Locust Beans, which name and that of St John's Bread they have received in consequence of an ancient opinion or tradition, that they and not the true (insect) locust are the 'locusts' which formed the food of John the Baptist in the wilderness. It seems more probable that they are the 'husks' (*kera-tion*) of the parable of the Prodigal Son.—The Arabs make of the pulp of the carob a preserve like tamarinds, which is gently aperient.—The carob-tree is too tender for the climate of Britain, but its extensive introduction into the north of India has been recommended. The produce is extremely abundant, some trees yielding as much as 800 or 900 lb. of pods. The wood is hard, and much valued, and the bark and leaves are used for tanning.—The LOCUST-TREE (q.v.) of America is quite distinct from this.

Carol, originally a term for a dance, or for songs intermingled with dancing, came afterwards to signify festive songs, particularly such as were sung at Christmas. In England the practice of singing Christmas carols was widely spread as early as the 15th century, to which date belong many of the carols printed in the collections of Ritson, Wright, and Sandys. Some of these ancient carols—'Cherry Tree Carol,' the 'Carol of St Stephen,' and others—preserve curious legends that have descended from a remote past. Unfortunately many of the traditional carols are not extant in early manuscript copies, and were greatly corrupted when they found their way into print. In the second half of the 18th century, a Birmingham publisher, T. Bloomer, did good service by issuing (in broadside form) all the carols that came to his notice. The first printed collection of carols

came from the press of Wynkyn de Worde in 1521. A unique fragment of it is extant, containing the famous 'Boar's Head Carol,' which is still sung at Queen's College, Oxford, on Christmas-day. Another collection (of which only a fragment has come down), printed by Richard Kele, appeared about 1550. In Ravenscroft's *Melismata* (1611) is found the carol 'Remember, O thou Man,' with musical accompaniment; and there are well-known carols, of a somewhat later date, among the *Roxburghe Ballads*. Besides the sacred carols that were sung in the open air, there were jovial carols that were sung at Christmas feasts. A small black-letter collection of these pieces was published in 1642, another in 1661, another is undated, and a fourth appeared in 1688. These collections, which are of the highest rarity, contain curious specimens of the songs that were sung by shepherds and ploughmen at Christmas entertainments in farm-houses. The Puritans did their best to discourage carol-singing; but the practice revived at the Restoration, and continued throughout the 18th century. Hone, writing early in the 19th century, predicted that in the course of a few years Christmas carols would be heard no more. His prediction has not been fulfilled; but for some time past it has been a growing practice to sing carols in churches instead of in the open air, and the quaint fantastic carols of old days are in consequence falling out of remembrance. William Sandys' *Christmas Carols, Ancient and Modern* (1833), is a very complete collection; and see Miss Rickert's *Ancient English Christmas Carols* (1909). In France the singing of Christmas carols, called *noëls*, was common at an early date. Collections of *noëls* were published early in the 16th century. In 1701 a collection was published at Dijon, in the dialect of the country. Another edition, with the title *Noël Borghignon de Gui Berzéai*, containing thirty-four *noëls* and two chansons, with music and glossary, appeared in 1720. Russian literature is very rich in carols, and religious songs generally. The best collection of them is by Bezsonov, under the title *Kalicki Perekhozhie*, or 'The Wandering Cripples,' the singers being beggars and lame people who go about for charity. There is a large store of Manx carols, or *caroal*, but only a very few have been printed. The *Llyfr Carolan*, or 'Book of Carols' (1740), contains sixty-six Welsh Christmas carols.

Carolina. See NORTH CAROLINA, SOUTH CAROLINA.

Carolina Pink. See SPIGELLA.

Caroline OF ANSBACH (1683-1737), the queen of George II. (q.v.). For her granddaughter, Caroline Matilda, see STRUENSEE, and a book by W. H. Wilkins (1904).

Caroline, AMELIA ELIZABETH, wife of George IV., was the second daughter of Charles William, Duke of Brunswick-Wolfenbüttel, and of George III.'s sister, the Princess Augusta of Britain. She was born on 17th May 1768. Ill-educated, vulgar in manner, and indiscreet, though kind-hearted enough, she was married to the Prince of Wales in 1795. The marriage was disagreeable to him, and although she bore him a daughter, the Princess Charlotte, he separated from her immediately on her recovery from childbed; and she lived by herself at Shooters Hill and Blackheath, the object of much sympathy, the people regarding her as the victim of her husband's love of vice. Reports to her discredit led the king in 1806 to cause investigation to be made into her conduct, which was found to be imprudent, but not criminal. In 1814 she obtained leave to visit Brunswick, and afterwards to make a farther tour. She visited the coasts of the Mediterranean, and lived for some

time on the Lake of Como, an Italian, by name Bergami, being all the while in her company. When her husband ascended the throne in 1820, she was offered an annuity of £50,000 sterling to renounce the title of queen, and live abroad; but she refused, and made a triumphal entry into London, whereupon the government instituted proceedings against her for adultery. Much that was very reprehensible was proved as to her conduct; but the manner in which she had been used by her husband, and the splendid defence of Brougham, caused such a general feeling in her favour, that the ministry were obliged to give up the Divorce Bill after it had passed the House of Lords. She now fully assumed the rank of royalty, but was refused coronation, and turned away with needless brutality from the door of Westminster Abbey on the day of the coronation of her husband, on 19th July 1821. On 7th August she died.

Caroline Islands, a group in the Western Pacific, lying between the Marshall and Pelew islands, with an area of about 270 sq. m., and a pop. of some 22,000; but the Pelew (q.v.) group is generally included in the Caroline Archipelago (area, 560 sq. m.; pop. 40,000), which thus stretches across 32 degrees of longitude and 9 of latitude. There are some 500 small atolls in the archipelago, but three-fourths of both area and population are included in the five volcanic islands of Babelthouap, Yap, Rouk, Ponapé (Ascension), and Kusari (Strong Island); these are all fertile and well watered, and many of the low-lying lagoons, though less so, are well wooded and to some extent inhabited. The climate is moist, but not unhealthy, and is tempered by cooling breezes. The people belong to the Micronesian stock, are strongly built, and are gentle, amiable, and intelligent; they are bold sailors, and carry on a brisk trade with the Ladrões to the north, where they have several settlements. Besides the usual products of the Polynesian islands, Copra (q.v.) has been largely exported. The islands were discovered in 1527 by the Portuguese, and called Sequeira; in 1686 they were annexed and rechristened in honour of Charles II. by the Spaniards, who, however, shortly changed the name to New Philippines. After the failure of several missionary attempts in the 18th century, Spain took little active interest in the group, until 1885, when the German flag was hoisted on Yap. In the sharp dispute which followed, the pope as arbitrator decided in favour of Spain. In 1887 disturbances broke out at Ponapé, in which the governor was killed by the natives. In 1899 the Caroline Islands were sold to Germany, Spain retaining a coaling-station. Seized in 1914, they are now held by Japan under the League of Nations. Yap (with a cable station) was a subject of dispute with the United States, settled 1921.—A British Caroline Island near the Marquesas is only 2 sq. m. in area.

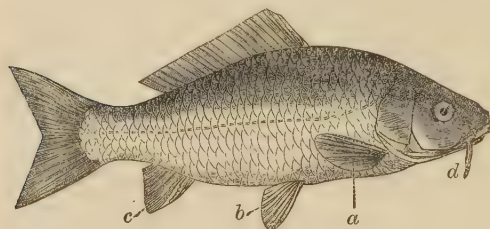
Carolings. See CARLOVINGIANS.

Carotid Artery, the great artery which on each side distributes blood to the different parts of the head, appears to have derived its Greek name *carotis* from Gr. *karos*, 'sleep,' there being an old idea that deep sleep was caused by the increased flow of blood through the carotids. Each carotid artery consists of the primitive or common carotid, which, at the upper margin of the larynx or organ of voice, separates into two great divisions, of nearly equal size—the external and the internal carotids. The external carotid supplies the larynx, pharynx, tongue, face, and scalp with blood; its principal branches being the superior thyroid, the lingual, the facial, the occipital, the posterior auricular, the internal maxillary, and the temporal. The internal carotid enters the cavity of the

cranium through a somewhat tortuous canal in the temporal bone, and after perforating the dura-mater, or fibrous membrane of the brain, separates into the anterior and middle cerebral arteries, which are the principal arteries of the brain; while in its course through the dura-mater, it gives off the ophthalmic artery. See AORTA, CIRCULATION.

Carouge, a Swiss town $1\frac{1}{2}$ mile S. of the city of Geneva. Pop. 7400.

Carp (*Cyprinus carpio*), a bony, fresh-water fish, in the physostomatous division, and type of the large family Cyprinidae. The body is covered with large scales; the head is naked; the wide, thick-lipped, terminal mouth is toothless, but there are teeth in the throat; a small barbule occurs on the upper jaw, and a large one at the corner of the mouth; the dorsal fin is long, the anal short, and



Carp (*Cyprinus carpio*):

a, fore-fin; b, hind-fin; c, anal fin; d, large barbule.

both have the third ray strong and toothed; the hind-fins lie about the middle of the ventral surface. The back is blackish gray or brown, the sides yellowish brown, the belly yellow. At the reproductive season the male bears white or brown tubercles on the head and sides. The usual length is between 1 and 2 feet, but large forms 5 feet long or more have been caught.

The carp is mainly vegetarian, but also eats small animals, such as larvæ and worms. The general habit is sluggish, except at the spawning period in May and June. The fecundity is very great; a single ovary of a moderate-sized specimen contains 700,000 or so eggs. They prefer ponds and the quiet parts of rivers. In winter they hibernate in the mud. Their longevity is great; some are said to have lived one hundred and fifty to two hundred years. The original home of the carp was in the central regions of Asia and probably also Europe, but it has been artificially spread everywhere—for instance in North America. They may be kept alive for weeks in damp moss; but are liable to skin diseases, and grow gray with mould. The carp was introduced into England before the 15th century. Fancy varieties have been reared, such as the King-carp, with few rows of large scales, and the Leather-carp, which is quite naked. *C. Kollarii* is a hybrid between carp and crucian (*Carassius*), or German carp, which like the Gibel (*C. Gibelio*) or Prussian carp, has no barbules. The Goldfish (q.v.) is *C. auratus*. The carp is a difficult fish for the angler, as it is by no means a free biter. It is an important food fish, and is easily bred. A good carp-pond, in Germany especially, is a by no means unimportant source of income. The carp is largely bred in the United States. See CRUCIAN.

Carpaccio, VITTORE, a painter of the early Venetian school, was born in Venice about 1455, and was early influenced by the Vivarini and Gentile Bellini. His rich colouring and accurate knowledge of perspective, his boundless invention and fancy, his powerful delineation of character, and his love of varied incident, are amply visible

in the nine subjects from the life of St Ursula, which he painted, 1490-95, for the school of St Ursula, Venice, and which are now preserved in the Accademia there. About 1494 he executed another work now in the same collection, 'The Patriarch of Grado casting out a Devil.' His next great series of works was the nine subjects from the lives of the Saviour, and Saints Jerome, George, Tryphonius, 1502-8, painted for the school of San Giorgio de Schiavoni, and still preserved there. In 1510 he executed for San Giobbe the noble 'Presentation in the Temple,' now in the Accademia, which is usually regarded as his masterpiece. His later works show a marked decline in power. Among these may be mentioned an altar-piece in San Vitale, Venice, 1514, and a group of ladies with pet dogs and birds (most unduly praised by Ruskin) in the Correr Museum. His latest dated works, at Pirano and Pozzale, are inscribed 1519; and he is believed to have died about 1522. The 'Virgin and Child adored by the Doge Mocenigo,' assigned to him, in the National Gallery, London, is probably not his. See a book by Molmenti and Ludwig (trans. Cust, 1907), and Crowe and Cavalcaselle.

Carpathian Mountains, the second great range of central Europe, extend in a great semicircle over a space of 880 miles from Presburg on the Danube to Orsova on the same river. They form two great masses, one in Czechoslovakia and Galicia to the NW., and one in Transylvania to the SE., with ranges of lower and wooded mountains between. The highest group of the Slovakian Carpathians is that of Tatra, reaching 8737 feet in the Gerlsdorfer Spitz; on the northern declivity small glaciers exist. Many of the western mountains are of limestone, while the mountains of Transylvania are mostly of primitive rocks. On the eastern and southern borders the latter reach their greatest height; Negoï, the culminating peak, has an elevation of 8320 feet. The range is generally clothed with wood to a height of 4000 feet, and with precipices, ravines, and volcanic cones, exhibits scenes of rare grandeur.

Carpathian Ruthenia (*Podkarpatská Rus*), a Ruthenian district on the south side of the Carpathians, taken from Hungary and made an autonomous province of Czechoslovakia; area, 5000 sq. miles; pop. 600,000 (370,000 Ruthenians, 104,000 Magyars, 80,000 Jews); capital, Užhorod (Mag. *Ungvár*); pop. 20,000.

Carpathos. See SCARPANTO.

Carpeaux, JEAN BAPTISTE, sculptor, was born at Valenciennes, 14th May 1827, and in 1854 obtained the *Prix de Rome*. His bronze Neapolitan boy attracted notice; and 'Ugolino and his four Sons' (1863), also in bronze, though it defied the canons of sculpture, made him famous. He settled in Paris in 1862. His *chef d'œuvre*, the marble group, 'The Dance,' in the façade of the New Opera in Paris, fully showed his dramatic power and the exuberance of his imagination; but it provoked much hostile criticism as involving an attempt to stretch beyond their natural province the limits of the plastic art. The most notable of his later works is the great fountain in the Luxembourg Gardens. He died 11th October 1875.

Carpel (Gr. *karpos*, 'fruit'), in Botany, a modified leaf forming the whole or part of the gynæcium or female (ovule-bearing) organ or organs of a flower (see FLOWER). The number of carpelary leaves may vary greatly; at first indefinite in the simplest flowers (e.g. Ranunculaceæ), it becomes definite, and may even be reduced to one (e.g. Leguminosæ, Berberidaceæ). The carpels may also unite more or less completely to form a compound ovary with or without united styles or

stigmas. This is characteristically three-celled in most monocotyledons (e.g. Liliaceæ), and five or two celled in most dicotyledons. The carpellary leaves, like any others, are in their simplest forms at first individually developed, and are clearly recognisable as reduced foliage leaves in Cycadaceæ. In Coniferæ they are further reduced, while in Angiosperms they never fully open as leaves at all, save sometimes in the splitting of the fruit after maturity. For their relation to the ovule, see OVULE, REPRODUCTION, SEED.

Carpentaria, GULF OF, a long and broad indentation of the north coast of Australia, stretching from 11° to 17° 30' S. lat., and from 136° to 142° E. long. Its name is said to have been derived from the river Carpentier, so named by Carstensz in 1623, in honour of Pieter Carpentier, governor-general of the Dutch Indies. The gulf contains many islands. Its eastern boundary is Cape York Peninsula. On the east it receives the Mitchell and Van Diemen rivers; at the south the Flinders, Leichhardt, and Albert; and on the west the Roper.

Carpenter, EDWARD, poet, born at Brighton in 1844, studied at Cambridge, and relinquished holy orders for lecturing, market-gardening, socialist propaganda, and literature. Walt Whitman he visited, wrote about, and followed, in verse-form as in democratic aims. His writings include *Towards Democracy* (1883-1902), *Civilisation, its Cause and Cure* (1889), *Love's Coming of Age* (1896), *The Art of Creation* (1904), *The Drama of Love and Death* (1912), *My Days and Dreams* (an autobiography, 1916), *Towards Industrial Freedom* (1917), *Pagan and Christian Creeds* (1920).

Carpenter, JOSEPH ESTLIN, theologian, was born in 1844, a son of W. Benjamin Carpenter (q.v.). He was lecturer (1875-1906) and principal (1906-15) of Manchester College. Besides *The Historical Jesus* (1911) and other theological books, he wrote on James Martineau and on his aunt Mary Carpenter (q.v.).

Carpenter, MARY, philanthropist, was born at Exeter, 3d April 1807, the eldest child of Lant Carpenter, LL.D. (1780-1840), Unitarian minister there, and afterwards at Bristol. The visit of Rammohun Roy to Britain in 1833, and of Tuckerman, the Boston philanthropist, had helped to turn her attention and sympathy towards India, and towards the destitute children of her own country. Trained as a teacher, she not only advocated the cause of neglected children in her writings, but founded in 1835 a 'working and visiting society,' of which she was secretary for more than twenty years, opened a ragged school in one of the worst parts of Bristol in 1846, and boys' and girls' reformatories at Kingswood and at the Red Lodge (1852-54), and superintended the last named. She promoted the Industrial Schools Act of 1857, and some of her proposals were adopted in the amended Acts of 1861 and 1866. In 1870 she instituted the National Indian Association, whose journal she edited. Her plan of day-feeding industrial schools in connection with school boards was adopted in 1876. She died 14th June 1877. Besides her reformatory writings she published *Our Convicts* (1864), a book which drew public attention to the treatment of young criminals; *The Last Days of the Rajah Rammohun Roy* (1866); and *Six Months in India* (1868). See *Mary Carpenter*, by J. Estlin Carpenter (1879).

Carpenter, WILLIAM BENJAMIN, biologist, Mary's eldest brother, was born at Exeter, 29th October 1813. He was educated at Bristol, passed some time in the West Indies with the family doctor, then studied medicine at Bristol, London (1833), and Edinburgh (1835-39). His graduation thesis (1839) on the nervous system of inverte-

brate animals led up to his *Principles of General and Comparative Physiology* (1838), one of the earliest works giving a general view of the science of life. Removing to London in 1844, he was appointed Fullerian professor of Physiology at the Royal Institution, lecturer or professor at the London Hospital and University College (1849), examiner at the university of London, and its registrar (1856). He also edited (1847-52) the *British and Foreign Medico-Chirurgical Review*, and a *Popular Cyclopædia of Science* (1843). His death, 19th November 1885, resulted from burns caused by the upsetting of a spirit-lamp. While vice-president of the Royal Society he persuaded it to apply to government for aid in investigations in marine zoology. Three voyages were made to the North Atlantic and Mediterranean by Carpenter and his colleagues. The *Challenger* expedition was a result which sprang from these expeditions. Carpenter made valuable researches on the Foraminifera; on the *Eozoön Canadense*; on feather-stars and crinoids; on the relation between mind and brain. His deep-sea explorations led him to advocate the doctrine of vertical ocean circulation sustained by opposition of temperature only, independent and distinct from the horizontal currents produced by winds. He did a great deal to popularise the use of the microscope by his *Microscope and its Revelations* (1856). Other works are *Principles of Human Physiology* (1846, and many editions); *Principles of Mental Physiology*; *Animal Physiology*; *Manual of Physiology*; *Zoology and Instincts of Animals*; *The Foraminifera*; *Use of Alcoholic Liquors* (1851); *Physiology of Temperance* (1870); *Mesmerism and Spiritualism* (1877); *Nature and Man* (with memoir by J. Estlin Carpenter, 1888).

Carpenter Bee, a name given to various bees which excavate their nests in wood. This is most



Carpenter Bee (*Xylocopa*):

Showing the cells for eggs and larvæ, excavated in dead wood.

economically performed by those which choose a pithy branch such as bramble or briar. *Ceratina albilabris* carves out a canal about a foot long, divided by partitions of glued pith particles into a series of perhaps a dozen chambers. More than a score of Hymenoptera, including not a few true bees, have a similar habit. Much more laborious is the work of *Xylocopa violacea*, a very large bee with deep violet wings, found in southern and middle Europe. She chooses rotting vine-props and espaliers, and with her mandibles unwearingly bites a hole a foot or more in length. The grain of the wood is followed, but the progress is not much over $\frac{1}{2}$ -inch per diem. The tube is divided into a dozen or so chambers by partitions of glued sawdust. Each chamber contains an egg with a store of honey and pollen, and the roof of each cradle forms as it is made the floor of the one above (see BEE). The North American *X. vir-*

ginica exhibits similar habits in great perfection. The common British *Megachile willughbiella* bores in willow-trees. Various species of *Osmia* also burrow. Lazier species sometimes gain possession of old holes.

Carpentras, a town in the French department of Vaucluse, on the Auzon, 17 miles N.E. of Avignon by rail. It was the *Carpentoracte* of the Romans, and a triumphal arch attests their former presence here. Carpentras has besides a cathedral (1405), the stately Porte d'Orange of the 14th century, a massive aqueduct (1734), and manufactures of cottons, woollens, &c. Pop. 10,000.

Carpentry may be described as the art of timbering, or combining and framing together pieces of timber in the construction of ships, bridges (and centering), roofs, scaffolding, &c., while joinery is the art of framing or joining woodwork for the finishing of houses, making doors, windows, stairs, &c. Carpenter work is put together with iron ties, bolts, and nails. Joinery includes all woodwork which can be put together with glue. Carpentry forms a most important branch of the civil engineer's and architect's labours, and many scientific principles are involved in producing the maximum of strength in the construction, with the minimum of weight in the materials employed. Every individual part should bear its due proportion of the strain, not only of its own weight, but of any outside pressure it may be calculated to resist. In America, where timber abounds, many ingenious uses have been made of it in the building of bridges, houses, &c. Iron is now superseding timber in many of its uses. Further information will be found in such articles as BRIDGE, BUILDING, FLOOR, ROOF, SHIPBUILDING, STRENGTH OF MATERIALS, TIMBER, &c. See also R. Scott Burn, *New Guide to Carpentry* (1871); T. Tredgold, *Principles of Carpentry* (7th ed. 1886), and works by Gould, Hatfield, Newlands, Riley (1906), and others.

Carpet-bagger, a term applied after the American civil war of 1861-65 to political adventurers from the northern states who tried to secure the votes of the negroes in the south; and implying that they had no property in the district save the contents of their carpet-bags.

Carpets. A carpet is a textile fabric used for covering floors. Its surface is generally formed of worsted yarn; but silk, goats' hair, and camel-hair are used to a limited extent in Eastern carpets, and cotton and jute carpets are also made. Two classes of carpet are to be distinguished: (1) piled fabrics in which the surface is woven into or knotted on a foundation of other woven fibre, and (2) flat surface textures composed of plain woven warp and weft. Felted fabrics and floorcloths are also used as floor-coverings, but these are not technically regarded as carpets.

The early history of carpets is very obscure, and is confused with that of tapestry. Both fabrics are made by the same processes, the essential distinction being in the use of tapestry for wall-hangings rather than for floor-coverings.

Persian Carpets.—The manufacture of these goes back to a very remote period. Indeed, it appears to be certain that pile carpets were first made in Persia, and from that country introduced into India by the Mohammedan conquerors. The Persian habit of sitting and sleeping on the ground probably brought into use soft floor-coverings suited to such a custom. Even among the higher classes in Persia carpets constitute the whole furniture of a room, except a few ornaments placed in niches in the wall. A Persian not only sits and sleeps upon, but also makes a table of, a carpet. Fine Persian fabrics of this kind are very highly prized for their beautiful and appropriate designs, and for the quiet harmony

of their colours. They are of great durability. Sir Murdoch Smith states that the floor of the chief pavilion of the Chehel Sitn palace at Ispahan is covered with a fine carpet which has been in use since the time of Shah Abbas, who reigned in the end of the 16th century. Persian pile carpets are made by firmly knotting tufts of woollen yarn on the warp threads, and these tufts are held in their place by the woof yarn. Whilst the lower-class carpets may have as few as twelve tufts of pile per square inch, elaborate and costly examples may contain up to four hundred tufts in that space. The richest Persian carpets are made in Kurdistan; but in the districts of Khorassan, Feraghan, and Kermak carpets of great beauty are also produced, each having distinctive qualities both of texture and design. The pile carpets of Persia do not appear to have been brought to Europe earlier than the 14th century; but thereafter they are frequently mentioned in inventories of the possessions of royal and important personages, and are shown in the interiors of early painters. Cardinal Wolsey adorned his Hampton Court Palace with numerous costly Oriental carpets. A carpet with the monogram E.R. and date 1576, in the possession of Lord Verulam, clearly marks its connection with Queen Elizabeth. In an inventory of property of Marie de' Medici are enumerated '*sept tapis de Perse*.'

The manufacture of pile carpets in the Persian style was set up in the Louvre in 1604, and ten years later it was transferred to the Savonnerie. In 1667 Colbert established the Gobelins, which to this day, along with Beauvais, continues to be a state manufactory of carpets and tapestries in the Persian style. In 1751 carpet-making was established by a Frenchman, Parisot, at Fulham, and about the same time the industry was begun at Axminster, whence it spread to Kidderminster and to Halifax. In the later half of the 19th century carpet and tapestry looms were set up by William Morris at Merton, in Surrey; and that constitutes the latest development of the industry in the Persian style.

Indian Carpets.—Both cotton and woollen carpets are made in India. Those composed of cotton are chiefly made in Bengal and Northern India, and



Fig. 1.—Carpet Loom, Cawnpore.

are usually in two coloured stripes, such as red and blue. They are often further ornamented with squares and diamond shapes, and occasionally with

gold and silver. Sir George Birdwood, a high authority on the history of Indian manufactures, considers that the patterns upon these cotton carpets, as well as those upon portions of some native dresses, illustrate the most ancient ornamental designs of India. The patterns on the woollen pile carpets of India can be traced back to Persian originals, and both fabrics are made in the same way. Many of the older ones, as well as some quite recently made, are scarcely less remarkable than those made in Persia for their beauty and other meritorious qualities. In numerous parts of India, however, the designs have suffered from European influence. Fig. 1 shows an Indian carpet loom; those used in Persia are equally primitive. Carpets are made in Kashmir, the Punjab, Sind, and on the Malabar coast; also at Agra, Mirzapur, Jubbulpore, Hyderabad, Masulipatam, and elsewhere. Some silk and velvet carpets are likewise made in India.

Turkey Carpets.—Like the carpets of Persia, India, and North Africa, these are made on rude simple looms by knotting tufts of woollen yarn on the warp threads across the width of the carpet, and firmly binding the rows of these tufts by the weft. The most characteristic patterns of Turkey carpets are diamond shapes and zigzags; that is, they are more purely geometrical than the Persian designs. The arrangement of the colours usually adopted produces a rich and pleasing effect, and the fabric, from its mode of construction and depth of pile, is extremely durable. Turkey carpets are chiefly made at Ushak, near Smyrna, in Asia Minor.

Kidderminster or Scotch Carpet.—This is the oldest kind of machine-made carpet. It has no pile, the yarn of which it is composed lying flat upon the surface like an ordinary worsted cloth. In some respects, although coarser and stronger, it resembles a woollen damask of two colours, and like it is reversible. The pattern is most perfect on the face side, but if in this position it shows a purple flower on a green ground, then on the other side the flower is green on a purple ground. This would be a two-ply carpet, the purple portion forming a separate layer from the green portion, except at the edges of the flower, where the yarn in passing from the front to the back binds the two layers together. A three-ply is in three layers, and is usually in three or more colours or shades of colour. The different layers are interlocked by the manner in which the threads are used to form the pattern. *Union Kidder Carpets* resemble the two-ply kind, except that, instead of being all wool, they have cotton warps and worsted wefts. In these the colour of the cotton usually fades before that of the wool. Kidderminster carpeting is woven on power-loom with Jacquard apparatus.

Brussels Carpet.—In this make of carpet the worsted threads are arranged in the warp, and are interwoven into a network of linen. Still the bulk of the carpet consists of wool. What is called a six-frame 'Brussels' consists of six layers or thicknesses of coloured worsted yarn, but there are also five-, four-, and three-frame carpets of this kind, each formed of a corresponding number of worsted



Fig. 2.

threads. Of these the best and thickest is the six-frame variety. The number of colours in the carpet indicates often, but not always, the number of frames used in its construction. These frames are placed behind the loom, and each of them contains about 260 reels or bobbins of worsted,

which as a rule is of one colour, that being the number of threads in a carpet of the usual width of 27 inches. But by a little ingenuity five or six colours can be arranged in a four-frame carpet, in which case only an expert can determine its quality. Brussels carpet is woven on a loom with a Jacquard apparatus (see LOOM), which raises such of the coloured yarns to the surface as the pattern requires at each throw of the shuttle. These are at the same time formed into loops by the insertion of wires, which are immediately withdrawn. Fig. 2 shows a section of a Brussels carpet in which these wires are shown.

Velvet Pile or Wilton Carpet.—This only differs from a Brussels carpet in having the raised loops cut so as to give it a velvet-like surface.

Tapestry Carpet (fig. 3), the name given to a carpet made of parti-coloured yarns by a very ingenious method patented by Mr Richard Whytock of Edinburgh in 1832. It resembles the 'Brussels' make inasmuch as the surface is formed of loops of worsted yarn, but instead of each thread being of a single colour, it is of several colours in the tapestry carpet. It is really a printed carpet, but it is only the woollen warp yarn, not the woven fabric, which is printed. These yarns are placed on a large drum which is traversed by small rollers charged with dyes, and thus the threads are printed in bands of various widths. When the parti-coloured warp threads are arranged for weaving, the pattern appears long drawn out. In that stage what are to be squares in the woven pattern appear as oblongs, and what are to be circles as ellipses.



Fig. 3.

The weaving draws them up into proper shape, and the looms are simple. Although the back of a tapestry carpet may be of any vegetable fibre, it is very frequently of jute, but the wool is practically all on the surface. In a Brussels carpet, on the contrary, the worsted yarns are not only on the surface, but in layers below it.

Carpets of undyed worsted yarn are made of a similar structure to the tapestry kind, and afterwards printed with a pattern on the surface.

Patent Axminster Carpet (fig. 4).—Mr J. Templeton of Glasgow patented in 1839 a method of making carpets by the use of chenille which are known by this name. The wool chenille is first woven on a separate loom, and cut into strips for the weft. In this kind of carpet the elements of the design or pattern exist in the chenille weft, which somewhat



Fig. 4.

resembles the parti-coloured warp yarn in the tapestry carpet; but this chenille, having a pile to begin with, does not require to be formed into loops. The surface of the carpet is in fact formed of weft lines of chenille, which, so to speak, has a backbone of thread. By means of 'catcher warps' crossing its backbone, the chenille is bound to a strong under-fabric of cotton, linen, or hemp.

Royal Axminster Carpet.—In 1878 a power-loom from America was introduced into Great Britain which quickly produced a marked influence on the carpet industry. Known in the United States and in France as the Moquette loom, it is a most

ingenious but complex machine. The carpet it makes differs from Templeton's patent Axminster in not requiring the preliminary weaving of the chenille, and from 'Brussels' in not requiring the use of Jacquard apparatus to weave it. In the Royal Axminster the pattern is arranged line by line on a succession of small spools of yarn, from which tufts are cut by machinery and fastened into the carpet by the interlacing of linen or jute warp and weft.

Jute Carpets.—Owing to the fact that jute is neither a very durable fibre nor easily dyed with permanent colours, carpets made of it are not highly esteemed, but they are much cheaper than other kinds. They are made (at Dundee on a very large scale) either with a looped or plain surface, and their patterns may be as beautiful as any on Brussels or Kidderminster carpet.

Seats of the Industry.—Whilst carpet-factories are widely distributed throughout civilised nations, the United Kingdom remains the principal centre of the industry. In England the leading seats are at Kidderminster and Halifax; but great factories exist also at Dewsbury and other Yorkshire towns, as well as at Stourbridge and Durham. In Scotland rich and costly patent and Royal Axminsters are made in Glasgow; Lasswade, near Edinburgh, and Elderslie, near Paisley, are homes of the tapestry carpet manufacture; whilst in various forms the industry flourishes at Kilmarnock, Darvel, Bannockburn, and Aberdeen. In the United States carpets are manufactured extensively at Philadelphia, Lowell (Mass.), and elsewhere.

Merits and Defects of Carpets.—The Royal Axminster has in these days quite superseded the Brussels carpet in public favour. Both it and the tapestry kind let less dust through them than a Kidderminster does. The latter, though an excellent fabric when well made, wears much sooner than either of the other two kinds to the extent of disfiguring the pattern on one side—that is, unless the tapestry carpet is of poor quality. The advantage of getting wear out of two sides does not bring a Kidderminster up to an Axminster or a Brussels in point of durability, but a Kidderminster is better in this respect than a fair quality of tapestry carpet. The patent Axminster carpet is very durable when it has a deepish pile; but if not carefully handled, a strip of its chenille gets loose, and this is a little difficult to repair. Carpets of graded sizes woven in one piece have within recent years come into public favour under the name of 'parquet carpets,' 'art squares,' or 'seamless carpets.'

The so-called Holy Carpet, sent annually from Cairo to Mecca with solemnities, is really a silk covering for the Kaaba. See MECCA.

Carpi, a town of Italy, 10 miles N. of Modena, with a cathedral (pop. 8000); also a village 28 miles SE. of Verona, celebrated for the victory obtained here by Prince Eugene over the French in 1701.

Carpini, or JOHANNES DE PIAN DEL CARPINE, a Franciscan monk, born in Umbria about 1182; was head of the mission sent by Pope Innocent IV. to the court of the emperor of the Mongols, whose warlike advances had thrown Christendom into consternation. A big, fat man, more than sixty years old, he started from Lyons in April 1245, and, crossing the Dnieper, Don, Volga, Ural, and Jaxartes, in the summer of 1246 reached Karakorum, beyond Lake Baikal, thence returning to Kieff in June 1247, and so back to Lyons. The hardships of the journey were great, and one ride of 3000 miles in 106 days surpasses the best records of most modern travellers. Prior to this, the most-monstrous fables had prevailed regarding the Tartars; and Carpini's Latin narrative was the

first to bring these myths into discredit. Hakluyt copied much of the work into his *Navigations and Discoveries* (1598); but the first complete edition of the text was D'Avezac's (1839). Carpini died Archbishop of Antivari some time before 1253.

Carpocrates OF ALEXANDRIA flourished in the first decades of the 2d century A.D., and founded the Gnostic sect of Carpocratians. According to him, the essence of true religion consisted in the union of the soul with the Monas or highest God, by means of contemplation, which elevated it above the superstitions of the popular faith, and liberated it from the necessity of submitting to the common laws of society. Among those who have attained to this are Jesus, Pythagoras, Plato, and Aristotle. Matter being regarded as the principle of evil, the soul had no obligations in regard to it, and the true rule of life was to cultivate an entire indifference to it, and simply follow one's own impulses. All life being an effluence from or a return to God, limitation or sin cleaves to all individual life as such. The soul's return to God is theoretically through the knowledge of the divine unity, and practically through a life that follows nature and overleaps all limits laid down for it by laws—e.g. the law of private property and the law of marriage, which were only instituted by the angels who made the worlds. The soul that attains to this freedom receives miraculous power; until it reaches it, it is held down by the world-makers in metempsychosis, remaining in the prison of bodily life until it has 'paid the uttermost farthing.' The Carpocratians existed down to the 6th century. See Gnostics.

Carpolites, the fossil fruits of certain Carboniferous trees. Some of these are heart-shaped bodies (*Cardiocarpon*); others are ellipsoidal, and usually three-angled (*Trigonocarpon*); and yet others are ellipsoidal, with a wrinkled and finely granulated surface (*Rhabdocarpon*).

Carpophore. In the fruit of geraniums and Umbelliferae the ripe carpels split away from the central axis from below upwards, but remain attached at top; hence in technical phraseology they are said to be suspended from a *carpophore*. See UMBELLIFERÆ, GERANIACEÆ.

Carpus, Carpal Bones. See HAND, FOOT, SKELETON.

Carpov, the name of a learned family, of which the most conspicuous members were BENEDICT (1595–1666), an important writer on law, who held high offices at Dresden and Leipzig; and his brother JOHANN BENEDICT (1607–57), professor of Theology at Leipzig, who published his *Systema Theologicum* in 1653.

Carracci. See CARACCI.

Carrageen, often incorrectly called CARRAGEEN MOSS, or IRISH MOSS, the Irish name of *Chondrus crispus*, and some other allied species of seaweeds, long of local importance as an article of food, but now widely diffused, especially in invalid cookery. The true carrageen is *Chondrus crispus* (order Florideæ, family Gigartineæ; see SEA-WEEDS), and it occurs commonly on rocky shores, particularly in North Europe, presenting many local varieties. Its congener, *Gigartina* (*Chondrus*) *mammillosa*, most frequently accompanies it. It is 2, 4, 6, or even sometimes as much as 12 inches long, branched by repeated forking, tough and flexible, and of variable colour; from yellowish green through shades of red to purple being most frequent. After being collected and washed in fresh water, it is bleached and dried in the open air; and is then white or yellowish, dry, shrunken, horny, and translucent. When treated for ten minutes with cold water, in the proportion of half

an ounce of carrageen to three pints of water, and then boiled and strained, it yields, with or without spices, a pleasant drink. With a larger proportion of carrageen, a thickish liquid or *mucilage* is obtained; and on boiling down this strong decoction, and cooling, a stiff *jelly* is procured. Milk



Carrageen (*Chondrus crispus*):
A, B, C, different forms of growth.

may be employed instead of water; and with the stronger preparation, along with sugar and spices, when thrown into a mould, a kind of *blanc mange* is obtained. It is much recommended in pulmonary consumption and other maladies, but its value seems to depend on its being a pleasant and digestible article of food; even its nutritive importance has, however, been greatly exaggerated; especially when we consider that a pound of stiff jelly contains only half an ounce of the dried weed! It is sometimes employed for feeding cattle, in the preparation of size by painters and calico-printers, in stuffing mattresses, and for other uses. The 'Ceylon Moss,' in similar use in the East, is *Sphaerococcus lichenoides*, another seaweed of the same order (Florideae), and is of similar properties and uses. 'Iceland Moss' (q.v.), however, is a lichen, *Cetraria islandica*.

Carranza, BARTHOLOMÆUS DE, born in 1503, at Miranda, in Navarre, entered the Dominican order, became professor of Theology at Valladolid, and in 1554 accompanied Philip II. to England, where he was confessor to Queen Mary, and where his zealous efforts to re-establish Catholicism gained him the confidence of Philip and the archbishopric of Toledo, the richest in Spain. Here, however, he was accused of heresy, and imprisoned by the Inquisition in 1559. In 1567 he was removed to Rome, and confined in the castle of St Angelo. He died a few days after his release, 2d May 1576.

Carrara, a town of Northern Italy, 30 miles NW. of Leghorn by rail. It is situated on the Avenza, near its mouth in the Mediterranean, and is surrounded by the marble hills which have made its celebrity. The town and its inhabitants are wholly given up to the marble trade. There are above 400 marble-quarries, larger or smaller, in the vicinity of the town, though very few furnish the marble used for statuary. The marble is a white saccharoid limestone, which derives its value to the sculptor from its texture and purity. It was formerly supposed to be of Archæan age, but is now known to be a metamorphosed Jurassic limestone. The quarries are on the side of the mountains, a branch of the Apennines, at heights varying from 500 to 3500 feet.

The mountains furnish, happily, an abundant supply of marble; for in two thousand years much has been wasted by primitive methods of quarrying. Besides the quarrymen, the marble employs many marble-cutters in the town, together with tombstone and other statuary of the humbler kinds, as well as sculptors. Similar marble is quarried at Massa and elsewhere. Pop. 40,000.

Carrara, or CARRARESI, a family which ruled Padua in the 14th century, named from the neighbouring village of Carrara.

Carrel, ALEXIS, French-American surgeon, born 28th June 1873 at Lyons, studied there, and was prosector of the faculty of medicine. He went to America in 1905, and became a member of the Rockefeller Institute in New York. He succeeded in keeping organs alive long after removal from the body, and applied his method to transplantation in surgery.

Carrel, ARMAND, a celebrated French publicist and republican leader, was born at Rouen in 1800, and was educated in the military school of St Cyr. After serving for some years in the army, he went to Paris, and devoted his attention to political and historical studies. In 1830, in connection with Thiers and Mignet, he became editor of the *National*, the ablest and most spirited of the journals opposed to the government of Charles X. Carrel's colleagues being employed by the new government of Louis-Philippe, he was left to conduct the *National* himself, which he did with a spirit and a freedom such as had not been witnessed in France for a long time. On more than one occasion he checked the arbitrary power which the government attempted to exercise, and gained the high admiration and esteem of the popular party. Government prosecutions of course followed his outspokenness, and heavy fines were decreed against him; but these were paid by public subscription, and each conviction only made his journal more famous. Carrel, however, dreaded revolution as much as he hated despotism, and had no sympathy with many of those who looked up to him as a leader. Provoked into a duel with Emile de Girardin, by an attack on his personal character, Carrel was mortally wounded, and died 24th July 1836. Littré and Paulin edited his *Œuvres Politiques et Littéraires* (5 vols. 1857-58).

Carriage is a general name for any vehicle intended for the conveyance of passengers either on roads or railways. Carriages are structures mounted on two or more wheels, and in form, build, and accommodation they are exceedingly diverse. The origin of the term is of course the same as *carry*, late Lat. *carriare*, to convey in a cart; *carr-us*, 'a car,' a word of Celtic origin. The earliest carriages were probably constructed for warlike purposes; but at a period so remote as the time of Joseph, carriages were used also at least for royal pageants (Gen. xli. 43). Among the Greeks, chariot-races formed an important feature in the Olympic games; the Romans had two, three, and four horse chariots; and according to Herodotus the Scythians had a covered chariot, the top of which was removable, and capable of being used as a tent. Of the carriage of modern times, the earliest record belongs to about the year 1280, when Charles of Anjou entered Naples, and his queen rode in a *caretta*, a small decorated car, the parent of the modern chariot or charette. Soon thereafter, in 1294, Philip of France issued an edict prohibiting the wives of citizens from using cars or chars, and later, Pius IV. (1559-66) exhorted his ecclesiastics to discountenance the womanly fashion of riding in coaches.

The first carriage ever seen in England—apart from the war-chariots of the early Britons—was

made in 1555 by Walter Rippon for the Earl of Rutland, and subsequently the same coach-builder made one for Queen Mary. These cannot have been very successful vehicles, for Taylor, the Water-poet, a determined enemy of the innovation, says: 'The first ever seen here was brought out of the Netherlands by one William Boonen, a Dutchman, who gave a coach to Queen Elizabeth, for she had been seven years a queen before she had any coach.' Later in the reign, the royal carriages had sliding panels, so that the queen could show herself to her loving subjects whenever she desired. During the closing years of Elizabeth's reign, and early in the 17th century, the use of pleasure-carriages extended rapidly in England. The coaches had first to struggle against the opposition of the boatmen on the rivers, and then against that of the sedan owners and bearers; but they gradually came into very general use.

These early vehicles were at best heavy and lumbering structures, without the springs and other mechanical adaptations which make a modern carriage a triumph of constructive art; and as they rumbled over the wretched roads, travelling in them must have been far from luxurious. The condition of the roads necessitated great strength and solidity in the vehicles; and improvements in carriage-building were of necessity preceded by improvement in the art of road-making. The suspending of the coach body by leathern straps, to insure ease of motion and freedom from violent jerks, was an amelioration introduced early in the 18th century. Subsequently these straps were attached to C-springs—an arrangement used to the present day in coaches proper. The elliptic spring on which most carriages are now mounted was invented in 1804 by Mr Obadiah Elliot, and since that time the improvements in carriages have been very numerous.

It would serve no useful purpose to enumerate the principal varieties of carriages, many of which are peculiar to particular countries, and are known by local names. Among the numerous ways in which road-carriages vary, the most important are the number of wheels, the method of entering, and the seating of the vehicle, the nature of the covering when the carriage is inclosed or partially inclosed, the number of persons it is designed to accommodate, and the arrangements for horsing. Road-carriages have either two or four wheels; examples of two-wheeled vehicles being the common gig, the Tilbury, the dog-cart, the T-cart, the Irish car, and the hansom-cab. Such vehicles require a pair of rigid shafts, because the load must be divided between the wheels and the back of the horse. In four-wheeled vehicles the horse or horses have only a dragging load, and the animal or animals may be yoked either between hinged shafts or by leathern traces alone, or by traces and a central splinter-bar. Examples of open four-wheel carriages are the Phaeton, the Wagonette, and the Brake. Partly-covered carriages are the Droskey or Droitska, the Victoria, and the Barouche. The Landau is the type of a carriage which at will can be entirely closed like the coach, or quite open by folding the covering flat back to both sides. The Coach is a permanently inclosed carriage, as is also the Brougham, which is only a miniature coach. The Mail-coach or Drag, like the Omnibus, has both outside and inside accommodation for passengers.

The manufacture of carriages, whether pleasure-vehicles or omnibuses, ranks in the highest class of mechanical labour. There is a necessity for the best materials and the best workmanship, since, owing to the severe strains and jerks to which the vehicles are subject, cheap construction is in the

end unprofitable. Many different kinds of wood are employed in the construction. The body of the carriage is made by one set of workmen, the under-framing by another; the former partaking more than the latter of the nature of cabinet-work. The steel-spring making is delicate work, owing to the necessity for combining strength with lightness and elasticity; and the various pieces of ironwork require careful adjustment, especially the axles. The covering of the upper part of the body of a carriage with leather is one of the most difficult parts of the manufacture; one single hide is employed, the leather being worked round the corners by repeated currying while wet; and all must be rendered smooth, without even a puncture. The best coaches receive as many as twenty to thirty coats of oil-paint; and the polishing processes are numerous and carefully conducted. The carving, gilding, herald-painting, lace and fringe work, metal ornamentation, &c., are among the best examples of their respective handicrafts. See CAB, COACHING; Thrupp's *History of Coaches* (1877), and other works by Ware (Phil. 1875), Stratton (1878), and J. W. Burgess (1881).

Carriage Dog. See DALMATIAN DOG.

Carrick, the southern division of Ayrshire (q.v.). The Prince of Wales is Earl of Carrick.

Carrickfergus, an Irish seaport town and urban county district, situated on the north side of Belfast Lough, on the south-eastern border of County Antrim, 9½ miles N. of Belfast and 12 miles S. of Larne by rail. Its chief feature is its picturesque castle, supposed to have been erected by De Courcy in the 12th century. It stands on a rock about 30 feet high, projecting boldly into the sea. But one gateway now remains of the ancient city walls. Here William III. landed seventeen days before the battle of the Boyne, and here Thurot made an abortive landing in 1760. Flax-spinning is carried on, and there is an oyster-fishery. Till 1898 the town of Carrickfergus was a county in itself, and in 1885 it ceased to be a parliamentary borough. Pop. 4000.

Carrick-on-Shannon, the capital of County Leitrim, on the Shannon, 98 miles NW. of Dublin by rail; pop. 1000.

Carrick-on-Suir, a town of Tipperary, situated on the Suir, which is navigable at this point, 14 miles E. of Clonmel, and 149 miles SW. of Dublin by rail. It has woollen, linen and flax factories, and a good trade in agricultural produce, and there are slate-quarries in the neighbourhood. There are the remains of a castle built in 1309, and belonging to the Butler family, a branch of which hence received the title of Viscount and Earl of Carrick. A stone bridge connects it with the suburb of Carrickbeg in County Waterford, which has an abbey (1336). Pop. (1851) 7512; (1881) 6583; (1911) 5235.

Carrier, JEAN BAPTISTE, an infamous member of the French National Convention, was born at the village of Yolai, near Aurillac, in Auvergne, in 1756. Entering the National Convention in 1792, he took an active part in the formation of the Revolutionary Tribunal, voted for the death of the king, demanded the arrest of the Duke of Orleans, and assisted in the overthrow of the Girondists. At Nantes, whither he was sent on a mission against the moderates in 1793, he found ample means for indulging his insatiable thirst for human blood. The utter defeat of the Vendéans had filled the prisons with captives, and Carrier proposed and carried a resolution for murdering the unhappy prisoners *en masse*. Accordingly, he compelled ninety-four priests to embark in a vessel, under pretence of deportation, and during the night drowned

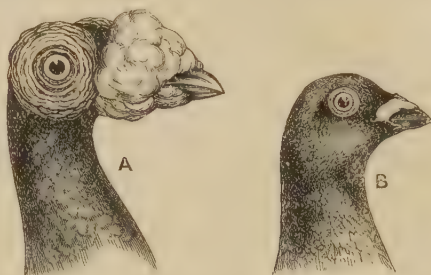
the whole of them, by having the ship scuttled. Such summary executions, called *noyades*, also 'vertical deportations,' were repeated to the number of twenty-five. Men and women also were tied together feet and hands, and thrown into the Loire; and this was called *mariage républicain* (republican marriage). The water of the Loire was so poisoned by corpses, that its use for drinking and cooking was prohibited. Five hundred political prisoners were shot, as in a *battue*, on the bridge near Nantes. In those massacres the form of trial was discontinued; and in four months 16,000 persons perished. Even Robespierre was offended by the enormities committed, and recalled Carrier, who boldly justified his own conduct before the Convention. The fall of Robespierre was, however, soon followed by outcries against Carrier; judgment was decreed against him, and he perished under the guillotine, 16th December 1794.

Carrier, MORIZ, a German philosopher and many-sided man of letters, born at Griedel, in Hesse, 5th March 1817, studied at Giessen, Göttingen, and Berlin, and in 1853 became professor of Philosophy at Munich. He is one of the founders of the modern school of thought which endeavours to reconcile Deism and Pantheism. His *Asthetik* and other works on *Æsthetics* (q.v.) have been widely read in Germany; and his important work, *Die Kunst im Zusammenhang der Kulturentwicklung und die Ideale der Menschheit* (5 vols. 1863-74), attained great popularity. He also published *Die sittliche Weltordnung* (1877), a thoughtful monograph on Cromwell, several volumes of verse, &c. He died 19th January 1895. His *Gesammelte Werke* (14 vols.) appeared in 1886-94.

Carrier Pigeon, a fancy variety of domestic pigeon; large in size, long in body and neck, bred in several different colours, and very remarkable in appearance from the great length of head and beak and enormous excrescences of white carunculated skin, called wattle, at the base of the beak and round the eyes. According to Darwin, the carrier is undoubtedly of Eastern origin, and is probably a descendant of the Persian messenger pigeon. It is stated in Moore's *Columbarium* (1735) that the carrier was first imported from Persia into Europe by Dutch sailors, 'being sometimes brought by shipping and sometimes in the caravans.' The striking appearance of the English carrier of to-day is due to the careful breeding of English pigeon-fanciers, and existed only to a very modified extent in the original imported bird. The Eastern carrier was probably very similar in appearance to the present 'dragon' pigeon, or to the formerly well-known 'horseman.' A good English show carrier should have a length of face of fully two inches, measured from the centre of the eye to the extremity of the beak. A stout box-beak is much esteemed, and the fineness of texture of the wattle is also an important property. From £50 to £100 has been paid for an exceptional bird—i.e. one good enough to take prizes in some of the many pigeon shows of this country. Having been bred for more than two centuries as a purely fancy variety, for show points alone, and its flying properties having been neglected, the English carrier has long since lost the attributes that gave it its name.

Moore states in his *Columbarium* that 'those who are possessed of true carriers, which are at present very scarce here, pay too dear, and have too great a value for them to risk their being lost' as letter-carriers. Like all highly developed fancy breeds, they are often delicate, and most of them are deficient in the strength, the intelligence, and the vigorous constitution necessary in a messenger bird. It is a common error to speak of the birds employed as messengers as 'carrier pigeons.' The

pigeons now made use of for long-distance flying and as message-bearers are called homers, or homing Antwerps, and are very different in appearance from 'carriers.' They are of medium



A, English Show Carrier Pigeon; B, Homer or Messenger Pigeon.

size, somewhat similar to the common pigeon in appearance, but heavier, stronger, and have larger heads.

The modern homer is a direct descendant of the pigeon voyageur of Belgium. The voyageur is a composite breed, resulting from a cross between the common thin-beaked blue rock (*Columba Livia*), the short-faced intelligent owl-pigeon, or smerle, the strong, determined, long-faced dragon, and the high-flying Antwerp cumulet, or other tumbler pigeon. The breed is now well established, and may be said to be of a general uniform type. From £40 to £50 has been paid for a good homer, a winner in a 500 miles race, but such a price is very exceptional. To insure the return of a homing pigeon that has been liberated far away from its home, a previous course of training is necessary. This is usually commenced in July, when the young birds are three or four months old. Those selected for training are placed in a basket, transported a short distance from home, and then liberated. These distances are successively increased in the same direction until the required stage has been reached. The following are the usual training stages, in miles from home: 1, 3, 6, 12, 21, 35, 50, 75, 100. There should be an interval of a few days between the tosses. Old birds may be 'jumped' farther than young ones. At three years of age 500 miles may be flown. Stages after 100 miles would be about as follows: 100, 150, 225, 325, 450 miles. These long distances are accomplished only by the very best birds. A large percentage of birds are always lost in training. Pigeon-racing is conducted through the medium of pigeon-flying societies or clubs. In England there are several such clubs. In Belgium, France, Germany, and Italy they are very numerous. Every bird competing in a race is stamped with a mark unknown to the owner until the bird is caught on his return home. About 800 yards per minute is an average velocity. The highest authenticated velocity is 2200 yards per minute, in a race of 150 miles. The greatest distance flown is 1100 miles, in America.

The nature of the faculty by the exercise of which homing pigeons are able to find their way back to their far-distant homes has been much discussed by ornithologists. It is probable that sight and memory are supplemented by the effect of training always in the same direction, and that the bird may be assisted by the position of the sun, and the directions of warm or cold winds. Pigeons are frequently jumped 250 miles—i.e. after they have flown home from a place 200 miles away, their next toss may be 450 miles. At a height of 430 feet, a moderate height for a pigeon, the range of view on level ground is 25 miles. There are many instances of the early employment of pigeons for

transmitting intelligence. The use of the dove by Noah suggests a knowledge of the bird's habits. It is recorded that pigeons were used as message-bearers by the early navigators of Egypt, of Cyprus, and of Candia, and by the Romans in connection with the Olympic games. Their first employment in war appears to have been at the siege of Modena, 43 B.C. About the middle of the 12th century a regular system of pigeon communication was organised between Bagdad and all the important towns of Syria, and was afterwards extended to Egypt. Pigeon-flying is still in vogue in Asiatic countries where telegraphs do not exist. Further instances of the use of pigeons as war-messengers are the sieges of Haarlem (1572), Leyden (1574), Ladysmith (1899-1900), and Przemyśl (1914-15), and by the Chinese at the beginning of the 14th century.

Much prominence was given to the pigeon-post during the siege of Paris (1870-71). No birds had been sent out of the French capital previous to the arrival of the besiegers. Every pigeon that flew into Paris with messages had been previously sent out by balloon. Of 363 birds which were thus sent out over the heads of the Germans, 302 were liberated, but only 73 reached the capital. As some performed the journey several times, only 57 different birds succeeded in accomplishing the task. The pigeons were collected at Tours and afterwards at Poitiers, but were liberated with their messages at the farthest point north that could be safely reached.

By the use of microscopic photography an enormous number of messages could be sent. By first printing the messages, then photographing them on a thin film or pellicle of collodion about $1\frac{1}{4}$ inches by 2 inches, each film could contain 2500 despatches of twenty words each. One bird could carry at least a dozen of these, making 30,000 despatches. A pigeon that arrived in Paris on the 3d February carried 18 pellicles containing 40,000 messages. The pellicles were rolled up and inserted in a goose-quill about $1\frac{1}{4}$ inches long, which was attached by a silk thread or thin wire along the upper surface of one of the tail-feathers. The weight of the messages was always less than 1 gramme ($15\frac{1}{2}$ grains). Pigeons will, however, carry 100 grains with ease, and for short distances have carried $\frac{3}{4}$ of an ounce (360 grains). The organisation of regular 'military pigeon systems' in almost every continental nation of Europe soon followed the Franco-German war. In France, Germany, Italy, and Denmark great encouragement is given by the state to private societies that fly their birds in directions fixed by the war ministers. England, on the outbreak of war in 1914, took measures to prevent the use of pigeons for communication with the enemy.

During the first half of the nineteenth century pigeons were extensively employed for the conveyance of intelligence, but up to 1830 their use was almost confined, in England, to publicans and prize-fighters. A little later, however, they became generally used by newspaper reporters, and secretly for stockbroking purposes. The first English loft established by a stockbroker was at Dover in 1834, and two years later, there were three lofts at Dover, containing a total of 600 birds, employed by London stockbrokers and by the custom-house authorities. Birds were also kept at Folkestone for similar purposes. There were lofts at Boulogne, and others between Dover and London. Four pigeons were often used to carry a message from a few miles south of Boulogne to London, a distance of 135 miles. In summer time the message carried by the pigeon would arrive in London by mid-day, whereas the Paris mail could not be expected before midnight. Large fortunes were made on the stock exchange by this means. Before the introduction of railways, the difficulties of training the birds

were very great, and 80 miles was the farthest distance flown by a pigeon in England. The Belgians were the pioneers of modern long-distance flying. According to Dr Chapin, their first pigeon-race was in 1818, when 100 miles was accomplished. In 1820 a pigeon flew from Paris to Liège, about 200 miles, and in 1823 the first race from London to Belgium took place. In 1830, 110 pigeons flew a race from London to Antwerp, the winning bird accomplishing the journey of 180 miles in 5 hours and 5 minutes. The Belgian birds, up to this date, were shorter in face and smaller than those used for flying in England. They were faster on the wing, but not so reliable in bad weather. The present pigeon voyageur dates from about 1835, when the Belgian birds were first crossed with the larger and stronger English flyers. By the strict application of the principle of the survival of the fittest, and by breeding only from birds that have proved themselves good workers, the breed of homing pigeons has continued to improve up to the present day. Belgium is still the chief pigeon-flying country of the world. Every village has a 'Société Colombophile.' Races take place chiefly from the south-west of France, and are generally flown on Sundays. During the summer months, special trains, loaded entirely with pigeons, leave Brussels every Saturday. In the annual 'Concours National' of 500 miles over 3000 pigeons often compete. In favourable weather this distance is accomplished in one day. In foggy weather many birds are lost.

Carriers are those who undertake the carrying of goods from place to place by land and sea. In many parts of the East, carrying is done mainly by camels, in South America by llamas, in various parts of Europe by mules and pack-horses (see CAMEL). In England and Scotland, after the pack-horse came the one-horse cart and the four-wheeled wagon, which until the opening of canals, and especially of railways, was the universal means of land-conveyance, and the carrying-trade became by degrees an immense organisation. Canals largely superseded wagons towards the end of the 18th century (see CANALS); and railways soon reduced canals to a very humble share in the business of carrying, even for such goods as minerals, coal, bricks, manure, and the like bulky goods of no great value. Railways still imply a vast amount of work for horses, wagons, carts, lorries, and men in bringing goods from the senders to the trains, and in delivering them to the consignees on their arrival at the nearest railway station. Even when the railways undertake the whole business of receiving and delivering the goods, they frequently employ the men and horses of companies quite independent of themselves. The name of Pickford was famous before the days of railways, and is famous still. At the present time, the tendency is for the companies to take the responsibility of the whole conveyance, the carriers acting as their agents, if willing so to do, or else endeavouring to maintain a fair competition. The goods-vans traversing the streets of the metropolis and other great towns are now more frequently inscribed with the names of railway companies than with those of private carriers. There are parcels delivery companies, and special developments of carrying, such as vans for removing furniture, which are themselves transported by rail. The introduction of the Parcel Post system (1883) has in some respects revolutionised the carrying-trade in Britain. In America the carrying-trade is largely in the hands of separate organisations, the Express Companies, who have special arrangements with the railways, and take all responsibility. Such Companies sometimes have the goods-traffic of a railway in their hands.

In Law, a common carrier is one who offers to the public to convey goods from one place to another for hire. The offer must be general—for a private person who contracts with another for carriage is not a carrier in the legal sense, and does not incur the peculiar responsibilities which, in almost every country, it has been found expedient to attach to the occupation of a public or *common* carrier. Carriage, in law, is thus a peculiar modification of the contract of hiring. The contract may be express, depending on the terms of any agreement permitted by law, or implied from the status of a common carrier who has received goods of the kind which he professes to carry. Such goods he is not entitled to refuse unless they are dangerous, or unless he has no room for them in his conveyance, or unless they are not brought in time for packing, or delivered in a state insecure and unfit for carriage. The vehicle must be sufficient for safe carriage, and the carrier is bound properly to pack. The regular course of the journey must be followed, and perishable goods must be forwarded with reasonable speed. The carrier should give notice, when receiving the goods, of any known unusual cause of delay. In Rome the responsibilities of carriers by water were regulated by a *prætorian edict*, which was applicable also to innkeepers and stablers; and from that edict the law of carriage in modern Europe has been mainly borrowed, sometimes directly, as in Scotland; sometimes indirectly, as in England. The ground on which the edict increased the responsibilities attaching to an ordinary contract of hiring was that the persons whom it enumerated were under peculiar temptations to consort, either personally or through their servants, with thieves or robbers, without the connection being such as to admit of proof. This responsibility in our own law extends not only to the acts of the carrier's servants, but also to those of the guests of an inn or the passengers in a conveyance. The only exception to this liability at common law is in the case of loss arising from the Act of God (q.v.) or the King's enemies—i.e. the fury of the elements, or war. Neither robbery nor theft is regarded as an inevitable accident. A common carrier is, in fact, at common law regarded as an insurer of the goods.

But there are several limitations imposed by the Carriers Act, 1830, and the Railway and Canal Traffic Acts, 1854 to 1913. The liability for gold and silver, and articles of unusual value, is restricted to £10, unless at the time of delivery the nature and value of the parcel are declared and an increased rate of charge paid; and the proof of value is laid on the person claiming compensation. On the other hand, it is provided that railway and canal companies shall be liable for neglect or default in the carriage of goods, animals, &c., notwithstanding any notice or condition or declaration made by the company for the purpose of limiting their liability. But the statutes permit 'just and reasonable' conditions to be imposed by special written contracts signed by or on behalf of the consignor. A specimen of what is regarded as a reasonable condition is that the company shall not be liable for loss in the case of goods which are improperly packed. The Act of 1856 also compels the companies to give fair all-round facilities as regards transit and through rates, and not to give undue preference to particular traders. As regards carriers by sea, under the Merchant Shipping Acts, 1904 and 1906, the owner or charterer of a British sea-going ship is not liable for loss or damage, occurring without his fault, to goods on board by reason of fire, or to gold, silver, watches, or precious stones by robbery, unless the nature and value of the articles have been declared in writing. Further, where loss or damage to goods occurs without the actual fault of the shipowner, he is not liable to an aggregate amount exceeding £8 per ton on the tonnage of the ship.

A railway company is a common carrier of goods (including live animals) and of the personal luggage of passengers; but it is not a common carrier of its passengers. Hence its obligation simply is to carry passengers with due care, and it is not liable for injuries to them unless negligence is proved. For the functions of the Railway Commissioners, and for the conveyance of passengers, see RAILWAYS.

Under carrier are included carters and porters who offer themselves for hire to carry goods from one part of a city to another. Wharfingers and warehousemen are liable only under the special contracts into which they may have entered, or in accordance with mercantile usage. Carriers on land are liable to make good to the owners of goods entrusted to them all losses arising from accidental fire. There are special statutory provisions as to the carriage of petroleum and dangerous explosives. Carriers have a lien upon the goods they have carried for payment of the carriage only. The lien is, however, restricted to the particular goods to which the carriage refers, and ceases on possession of them having been given up. It does not cover any other account or balance due either by the sender or consignee to the carrier.

In the United States a 'private' carrier, who carries for hire, but is not a common carrier, is, like other bailees for hire, liable only for the exercise of ordinary diligence. The liability of common carriers by land or water in the United States is at common law the same as in England. A contract qualifying this common law liability may be established by framing a notice, brought to the knowledge of, and assented to by, the owner of the goods or his agent, whereby the carrier stipulates for a qualified liability; but a carrier cannot contract out of liability for his own negligence or the negligence of his servants and agents. The rule as to passenger carriers is, as in England, that they are not responsible as insurers of the safety of the passengers as common carriers of goods are, but are liable only for injuries resulting from negligence. The Inter-state Commerce Act of Congress of February 4, 1887, prohibits common carriers from discriminating, in the transportation of passengers or property, between persons or places, and lays down much the same rules as regards undue preference and equal facilities as the British Act of 1856. It also prohibits charges which are not just and reasonable. It compels common carriers to print and make public 'the rates, fares, and charges for transportation of passengers and property,' and forbids combinations among common carriers to prevent the carriage of freights from being continuous from place of shipment to destination.

This act, which has been amended by a long series of more recent acts, created an Inter-state Commerce Commission, a special administrative and semi-judicial tribunal to investigate tariff rates and regulations, and to carry out the purposes of the act. By act of June 29, 1906, this commission was increased to seven members, with terms of seven years. It has exclusive jurisdiction to determine the reasonableness and legality of rates and regulations, and, since 1906, has power to prescribe reasonable rates for rates found to be improper. The commission is a body corporate, and is capable of being a party in a suit in the federal courts. The Commerce Court, created in 1905, has been abolished by act of October 22, 1913, and its jurisdiction transferred to the district court, with an appeal to the Supreme Court. Common carriers, under these acts, are still entitled, as at common law, to make special contracts, to classify their tariff, and to adjust and apportion their rates, but their powers are exercised subject to the conditions that the charges shall not be unreasonable, and shall not unjustly discriminate so as to give undue

preferences. The term common carrier, as used in the Inter-state Commerce Act and its amending acts, has a very extensive application, including, e.g., express and sleeping-car companies, telegraph, telephone, and cable companies, and oil-pipe lines.

Carrion Crow. See CROW. The name is sometimes applied in America to a species of vulture. See VULTURE.

Carrion Flowers, a name which, on account of their smell resembling that of putrid meat, has been given to the flowers of many species of *Stapelia*, a genus of Asclepiadeæ, which is otherwise remarkable for the succulent development of the cellular tissue of the stem and reduction of the leaves, resulting in a general aspect like that of



Carrion Flower (*Stapelia variegata*).

the Cactus family. There are about 100 species, all natives of South Africa. The flowers are often large and marked in dirty red and yellow, and the stench is very strong. They attract short-tongued carrion flies, and by these visitors cross-fertilisation is effected. *Ceropegia* is similar, as are, in other orders, *Rafflesia*, *Aristolochia*, *Arum*, *Helicodieros*, &c. Some temporarily imprison the fly until the pollen is mature.

Carroll, CHARLES (1732-1832), American revolutionary patriot, was a man of large property in Maryland, being accounted the richest man in all the colonies. He was the last survivor of those who signed the Declaration of Independence.

Carroll, LEWIS. See DODGSON, CHARLES.

Carrollton, since 1873 a northern section of New Orleans (q.v.).

Carron, a village in Stirlingshire, on the right bank of the river Carron, 2 miles NNW. of Falkirk. Its great ironworks, established in 1760, and employing 3000 men, till 1852 produced 'carronades' and other guns, and now turn out stoves, grates, boilers, pipes, &c.

Carronades were short cast-iron guns, of all calibres from 6-pounders to 68-pounders, invented in 1752 by General Robert Melville, and first made by Mr Gascoigne in 1779 at the Carron Ironworks. They were chambered, and attached to the carriage by a loop underneath instead of trunnions. Firing a comparatively large shot accurately at close quarters, they were at that time well adapted for use on board ship, but have long been superseded. See CANNON.

Carron Oil. See BURNS AND SCALDS.

Carrot (*Daucus*), a genus of Umbelliferae, containing about 20 species, mostly natives of the Mediterranean countries. The common carrot (*D. Carota*) is a biennial plant, which ranges as far as India in the wild state, and is universally cultivated for the sake of its root. In all varieties of the wild plant this is slender, woody, and of a very strong flavour; that of the cultivated variety is much thicker and more fleshy, much milder in its flavour and qualities. Its colour is generally red, but sometimes orange or yellowish white. The

sub-varieties in cultivation are also distinguished by their form—some being longer and more tapering than others—by their size, and by the duration of their growth; the *early* kinds, 'Horn carrots,' being also comparatively small, and almost exclusively cultivated in gardens for culinary use, whilst the larger and *late* kinds, 'Long carrots,' are often also grown in fields, especially on the Continent, for feeding cattle. The carrot was known to the ancients, but is said to have been introduced into England from Holland only in the 16th century. In the reign of Charles I., Parkinson relates that ladies sometimes wore carrot-leaves as an ornament instead of feathers; and the beauty of the leaves is still occasionally acknowledged by placing a root, or the upper portion of one, in water, that it may throw out young leaves to adorn apartments in winter. The carrot prefers a light and rather sandy soil, but often succeeds very well on a peat soil.

Besides the various uses in cookery and in feeding cattle, carrots have been roasted and ground in Germany as a substitute for coffee; a syrup is also sometimes prepared from the roots, and even an ardent spirit distilled after fermentation. Carrots were formerly also of some medicinal repute as a laxative, vermifuge, poultice, &c.; and the 'seeds' (mericarps) have been employed as a substitute for caraways.

The carrot has many insect enemies which often inflict the greatest injuries upon the crop. Besides suffering from the attacks of a large number of lepidopterous larvæ (*Depressaria*, &c.), the leaves have one or two species of aphids peculiar to them. Serious subterranean mischief is often wrought by the larva of the cockchafer (*Melolontha*), and still more by the larva of *Agriotes segetis*, one of the wire-worms so dreaded by farmers. The larva of the carrot fly (*Psila rosæ*) eats away the surface of the root, causing the so-called rust of carrots.

The Native Carrot of Australia (*D. brachiatus*) is good sheep-fodder when young. In Tasmania the name is erroneously given to *Geranium dissectum* (*pilosum*), whose root is often tuberous. The Deadly Carrot, *Thapsia silphium*, was once of great medical repute.

Carsebreck, the great Scottish curling centre, 11 miles NNE. of Stirling by rail.

Carson, CHRISTOPHER (1809-68), commonly known as KIT CARSON, born in Kentucky, emigrated to Missouri, where for many years he led the life of a trapper and hunter. His intimate acquaintance with Indian habits and languages secured his selection as a guide in Frémont's explorations, and as Indian agent in New Mexico, to which post he was appointed in 1853. For services in this quarter during the civil war, he was breveted brigadier-general. See his *Life* by Charles Burdett (Phila. 1869).

Carson, EDWARD HENRY, BARON, a distinguished barrister at the Irish and English bars, and leader of the Ulster die-hards, was born 9th February 1854, and educated at Trinity College, Dublin, which he represented in parliament, 1892-1918. A bitter opponent of Home Rule, he organised armed resistance by the formation of the Ulster Volunteers and the 'Covenant' of 1912. In the Coalition cabinets he was Attorney-general (1916), First Lord of the Admiralty (1917), and minister without portfolio (1917-18). In 1918-21 he sat for a Belfast division. He accepted the compromise of 1920, and in 1921 became a Lord of Appeal with a life peerage.

Carson City, capital of Nevada, near the foot of the Sierra Nevada, 178 miles ENE. of San Francisco, has a mint and quartz-crushing mills. Gold and silver are found near by. Pop. 2000.

Carstares, WILLIAM, a distinguished political and ecclesiastical character of the 17th century, who took a very active part in bringing about the Revolution of 1688, was born at Cathcart, near Glasgow, February 11, 1649. He entered the university of Edinburgh in 1663, where he displayed a remarkable aptitude for learning, and graduated in 1667. Carstares went to study theology at Utrecht (1669), where his scholarship, polite address, knowledge of men, and great political information, especially regarding his own country, recommended him to the notice of the Prince of Orange, who chose him as his confidential adviser in all matters relating to Britain. In 1672 he went to London; in 1675 he was arrested and examined before Lauderdale for alleged 'tampering in several matters tending to the disturbance of the public peace,' and was kept prisoner in Edinburgh Castle till 1679. In 1682, being in England on a mission of observation from Holland, he was employed to negotiate between the English and Scotch conspirators a general rising in England and Scotland, Shaftesbury, Russell, and Argyll being the leaders. He knew of the Rye House Plot, but did not approve of it. He was arrested at Tenterden, Kent, conveyed to Edinburgh, and put to the torture of the boot and thumb-screw; a deposition was extracted from him as to his knowledge of Argyll's plot, which, in spite of assurances to the contrary, was immediately used in the trial of Baillie of Jerviswood. After an imprisonment of a year and a half, at London, Edinburgh, and Stirling, he returned to Holland about the beginning of 1685; was appointed second minister of the English church at Leyden (1686) and chaplain to the Prince of Orange, with whom he had constant and confidential intercourse. He accompanied him as chaplain in the invasion of 1688, and after the prince had been firmly established as William III., Carstares was instrumental in effecting a reconciliation between him and the Scottish Church, when the ill advice of other councillors had nearly led to an open rupture. From 1693 to the death of the king in 1702 he could not have had more influence in Scottish affairs if he had been prime-minister of the country; his authority in church matters was such, that he was popularly called 'Cardinal Carstares' by the Jacobites. He was elected principal of the university of Edinburgh in 1703. In 1704 he was presented to the church of Greyfriars, and was appointed Moderator of the next General Assembly, an office to which he was four times elected in the course of eleven years. His great influence was used in procuring the passage of the Treaty of Union. He died 28th December 1715, deeply regretted by the whole nation, leaving a high reputation for tact and ability in ecclesiastical policy, as well as for sincere piety and unbounded private charity. See *Life of Carstares*, by Principal Story (1874).

Carstens, ASMUS JAKOB, a Danish artist, the reviver of art in Germany, was born near Sleswick, May 10, 1754. Apprentice for five years to a wine-merchant, in 1776 he went to Copenhagen to study art; for five years (1783-88) barely supported himself by portrait-painting in Lübeck; and after settling in Berlin, had two years to pass in pinching poverty before his great composition, the 'Fall of the Angels' (with 200 figures), gained him an appointment as professor in the Academy, employment from the court, and a pension. He was now enabled to visit Rome, where he devoted himself to the study of the works of Michael Angelo and Raphael; and his influence in elevating later German art, and in inducing a keener study of these masters, cannot be too highly estimated. His numerous drawings mostly represented scenes from

the ancient classic poets, with subjects from Shakespeare and Ossian. Having broken with the Berlin Academy, he died in the deepest poverty at Rome, May 25, 1798. See his *Life* by Fernow (1806; new ed. 1867), and works by Schöne (1866) and Sach (1881).

Cart, a species of carriage with two wheels, thus differing from the ordinary four-wheeled wagon. The Scotch cart, used also in the north of England, is exceedingly convenient for general merchandise or for agricultural produce, and is well adapted for being drawn on roads in a hilly country. Its weight is only about half a ton, while its usual load is from a ton to 22 cwt. Its carrying capacity for hay or straw may be increased by adding 'topsides' or a sparred frame. Offenders used to be ignominiously exposed by being carted through a town; and were sometimes whipped at the cart's tail. All carts in Great Britain must by law bear the name and address of their owner conspicuously marked on them.

Cartagena, a fortified seaport of Spain, on a bay of the Mediterranean, 326 miles SE. of Madrid by rail. It is built partly on the declivity of a hill, and partly on a plain extending down to the sea, and is inclosed by hills which screen it from all winds. The harbour is one of the best in the Mediterranean, capacious enough to hold the largest fleets. The entrance is narrow, and completely commanded by a fortified island on the south. It was formerly the largest naval arsenal not only in Spain but in Europe. The city presents a Moorish aspect in its streets, its cathedral, and its ruined castle. Cartagena has manufactures of ropes, sail-cloth, and glass, besides extensive blast-furnaces and smelting-works, and exports lead, silver, iron, esparto grass, &c. Pop. of town and suburbs about 100,000. Cartagena, which was a colony of the Carthaginians, was built by Hasdrubal 242 B.C., under the name of New Carthage. It formed the headquarters of the Carthaginians in Spain, and soon became a city of much wealth and influence. It was captured by P. Scipio in 210 B.C., and became of importance under the Romans, who are said to have employed 40,000 men daily in the neighbouring mines. It was sacked by the Goths, and did not again attain any note until the time of Philip II. In July 1873 Cartagena, with its arsenal and war-ships, was seized by a communal junta, but was retaken by the national forces in January 1874.

Cartagena, one of the principal cities of Colombia, stands on a sandy island off the north coast, to the SW. of the mouth of the Magdalena, and communicates by four bridges with its suburb, Jetsemani, on the mainland. Though it has the best harbour on the coast, its trade greatly fell off after the rise of Sabanilla and Puerto Colombia; but a canal connecting it with Calamar, on the Magdalena, has been reopened, and a railway built to the same place; and a return of prosperity has followed the development of the Atrato River gold and platinum fields. The streets are narrow, with high houses, but the place is well built, in the old Spanish colonial style, has an air of dignity and antiquity, and possesses a university, a handsome cathedral, and several churches. The old massive fortifications in part form a promenade. Founded in 1533, it was burned by Drake in 1585, but in 1741 repulsed an attack by Admiral Vernon. In 1815 the royalist General Morillo reduced the place by hunger, after a brave defence; but in 1821 it was again freed from the Spanish yoke. Pop. of Cartagena (or *Cartagena de las Indias*), 50,000.

Cartago, (1) a river and almost landlocked bay or lagoon, communicating with the Caribbean Sea, near the northern extremity of the Mosquito Coast. —(2) A town of Costa Rica, 12 miles E. of the

present capital, San José, on a plain S. of the volcano of Irazú (11,500 feet), was capital till 1841, when it was all but destroyed by an earthquake; pop. 20,000.

Carte, RICHARD D'OYLY (1844-1901), born in Soho, London, was a musical-instrument maker who composed songs and from 1870 produced English comic operas. The success of *The Sorcerer* (1877) and subsequent operas by Gilbert and Sullivan, with whom he is specially associated, enabled him to build the Savoy Theatre.

Carte, THOMAS, historian, was born in 1686 at Clifton-upon-Dunsmore, near Rugby, Warwickshire, where his father was vicar. Educated at University College, Oxford (1698-1702), he took his M.A. both there and at Cambridge, and receiving holy orders in 1707, was appointed reader at the Abbey Church, Bath. In 1714, however, being strongly attached to the Stuarts, he resigned his office rather than take the oaths to the Hanoverian government. In 1722 he was suspected of complicity in the conspiracy of Bishop Atterbury, whose secretary he was, and £1000 was offered for his apprehension; but he escaped to France, where he remained till 1728. After his return, he published a *Life of James, Duke of Ormonde* (2 vols. 1736), more full than lively, and a *History of England* (4 vols. 1747-55), bringing it down to the year 1654. The prospects of this work were blighted by an unlucky note in vol. i., ascribing to the Pretender the gift of touching for the king's evil. It is very valuable for its wealth of original materials, but the author had not the capacity to grapple with these philosophically. Hume and other historians, however, were much indebted to him for their facts. Among Carte's other works was an edition of Thuanus (De Thou, q.v.); and at his death, in 1754, he left behind him 20 folio and 15 quarto volumes of MSS. in further illustration of the history of England to 1688, which are preserved in the Bodleian Library, Oxford.

Carte Blanche, a 'blank paper' authenticated with an authoritative signature, and entrusted to some one to be filled up as he may think best. Thus in 1649 Charles II. tried to save his father's life by sending from the Hague to the Parliament a signed carte blanche to be filled up with any terms which they would accept as the price of his safety. In 1832 Earl Grey was said to have been armed with a carte blanche for the creation of new peers.

Cartel (dim. of *carta*, 'paper') means variously a challenge and a written agreement between belligerents for an exchange of prisoners. Cartel ship is a vessel commissioned to convey exchanged prisoners. For Cartel in its commercial sense, see ASSOCIATIONS, TRUSTS, and CARTELS.

Carter, ELIZABETH, an English lady remarkable for her knowledge of ancient and modern languages, was born 16th December 1717, at Deal, Kent, and was the daughter of a clergyman. In her twenty-first year she published a small volume of poems, and in the succeeding year she translated (anonymously) from the Italian of Algarotti *Sir Isaac Newton's Philosophy explain'd for the Use of Ladies*. These publications brought her into note, and obtained for her the friendship of such men as Bishop Butler, Archbishop Secker, Sir Joshua Reynolds, Burke, Horace Walpole, and Dr Johnson, the latter of whom especially held her in great esteem, and had a high opinion of her proficiency as a Greek scholar and a good housewife. Her translation of Epictetus was most favourably received by the literary press of her time, both at home and abroad. She died in London unmarried, 19th February 1806, at the age of eighty-eight. See her *Life* by Pennington (1807), and by Miss Gaussen (1906).

Carteret, JOHN, EARL GRANVILLE, one of the most eminent British orators, diplomatists, and statesmen of the 18th century, was born April 22, 1690, his father, who died when he was five years old, being Baron Carteret of Hawnes, Bedfordshire. He received his education at Westminster School and Christ Church College, Oxford. From Oxford he proceeded to London, plunged into the political and social excitements of the period, made the acquaintance of Swift, and in 1710 married Lady Frances Worsley. Entering the House of Lords on May 25, 1711, as second Baron Carteret, he espoused the side of the Whigs, then led by Stanhope and Sunderland, and in 1714 made his first speech in the House of Lords in support of the Protestant Succession. On the accession of George I., the Whigs came into power, and Carteret became a Lord of the Bedchamber. In 1719 he was appointed by Stanhope ambassador extraordinary to Sweden, and succeeded in arranging two treaties of peace, the first between Sweden, Hanover, and Prussia, and the second between Denmark and Sweden. In 1721 he was appointed to one of the two foreign secretaryships, that for the 'Southern Department' of Europe, and as such, attended in 1723 the congress of Cambrai which attempted the settlement of differences between Germany and Spain, and accompanied George I. to Berlin. In 1724 Carteret was appointed Lord-lieutenant of Ireland. His administration, which lasted, with an interruption, till 1730, was decidedly successful, for, although one of his first acts was to order the prosecution of the author, printer, and publisher of *Drapier's Letters*, it was on his recommendation that Wood's coinage was abandoned in 1725. Although he came into collision with Swift over the Drapier prosecution, the two became warm friends before Carteret left Ireland. Between 1730 and 1742 Carteret took the lead in the House of Lords of the party opposed to Sir Robert Walpole. When this opposition succeeded in overthrowing Walpole, Carteret became the real head of the administration which succeeded his, although nominally only Secretary of State for the Northern Department. Carteret held this position till 1744. His foreign policy, it is now generally admitted, was essentially a wise one, its main object being the bringing about of an understanding between Maria Theresa, Frederick the Great, and the Emperor of Germany, and the detachment of the last from his alliance with France. But he had no time to develop it, being driven from power by the Pelhams in 1744, about a month after he became Earl Granville on the death of his mother, who had been created Countess Granville in her own right. In 1751 Carteret consented to become Lord President of the Council under Henry Pelham. But although he held this office till his death, and twice refused the premiership, he was no longer a very pronounced force in British politics, acting chiefly as a medium of communication between his sovereign and the leading politicians of the time. He was, however, instrumental in bringing the elder Pitt into office, and greatly admired his powers. Carteret died at his house in London, January 2, 1763. He was twice married. His first wife died in 1743. In 1744 he married the leading beauty of the day, Lady Sophia Fermor, who, however, died the following year. Carteret, who is described by Horace Walpole and Lord Shelburne as of 'commanding beauty,' was one of the first orators, purest patriots, keenest wits, brightest classical scholars, and most ardent convivialists of his time.

The chief authorities on the life of Carteret are *Lord Carteret*, by Archibald Ballantyne (1887), and the *Carteret Papers* in the British Museum. Carlyle's *Frederick the Great*, Craik's *Swift*, Mahon's *England*, Lecky's *England in the 18th Century*, Horace Walpole's *Correspondence*, Graham's *Annals of the Earls of Stair*, *The Marchmont*

Papers, and Lord E. Fitzmaurice's *Life of Shelburne* may also be consulted.

Carteret, PHILIP, navigator, sailed as lieutenant in Byron's voyage, and commanded the second vessel in Wallis's expedition to the southern hemisphere (22d August 1766). Separated from Wallis in the following April, while clearing the Strait of Magellan, he proceeded alone, discovering Pitcairn's and a number of other small islands, one of which, in the Solomon Archipelago, bears his name, and returned round the Cape of Good Hope to England, 20th March 1769. His long voyage, in a ship ill-found and unseaworthy, added much to the geographical knowledge of his time. He retired from active service in 1794 with the rank of rear-admiral, and died at Southampton, 21st July 1796.

Cartesian Devil, DIVER, or BOTTLE IMP, is a scientific toy named after Descartes. A tall glass vessel is nearly filled with water, and covered with an air-tight piece of bladder or india-rubber. In and on the water floats a small hollow figure, with a hole near the top, partly filled with air and partly with water. When the cover of the glass is pressed, the air beneath is compressed and water enters the floating figure (so as to bring the air in it to the same degree of compression), and the figure sinks in the water, not rising again till the pressure is removed.—For the CARTESIAN PHILOSOPHY, see DESCARTES.

Carthage, a city on the north coast of Africa, the capital of one of the great empires of the ancient world. It was situated on a peninsula at the north-east corner of the region now known as Tunis, and was founded, most probably about the middle of the 9th century B.C., by Phœnicians who came either from Tyre or from the Tyrian settlement of Utica. The Carthaginians were thus of Semitic origin. They were an offshoot from the Canaanites who occupied Palestine before the Jewish invasion, and whose language was closely akin to Hebrew. The name Carthage is a corruption of Kirjath, the Canaanite word for a town, which occurs in Scripture in such names as Kirjath-Baal and Kirjath-Jearim. The city, called Carthāgo by the Romans, and Karchēdōn by the Greeks, was known to its own inhabitants as Kirjath-Hadeshath, or the New Town, to distinguish it either from Tyre or from the earlier Phœnician colony of Utica. Its history may be divided into three periods—the period before 509 B.C., when the first treaty was concluded with Rome; the period of the Græco-Phœnician wars in Sicily; and the period of the Punic wars, from 264 B.C. to 146 B.C.

Of the city's rise to power and opulence nothing is known. It does not come within view of the historian until the 6th century B.C., when it appears as centre of a great commerce and the capital of extensive dominions, including part of the north coast of Africa, Sardinia, part of Sicily, and probably Malta. Corsica was acquired about the close of the century. A hegemony was established over Utica, Hadrumetum, Hippo, and the other Phœnician cities in Africa, from which a money tribute was received, while a tribute in kind was exacted from the neighbouring African tribes. Besides pure Canaanites, the Carthaginian population included a large number of Liby-Phœnicians, or half-breeds, the offspring of unions of Phœnicians and Africans. These half-breeds were regarded with keen jealousy by the rulers of the city, and the famous expedition of Hanno, which took place, as far as can be ascertained, towards the close of the 6th century B.C., was fitted out to transport them to distant settlements. There is in the library of Heidelberg a Greek manu-

script termed the 'Periplus' (or 'Circumnavigation'), which is said to be a translation of the account of his voyage placed by Hanno in the temple of Moloch at Carthage. According to this narrative, Hanno sailed beyond the Pillars of Hercules; founded cities of the Liby-Phœnicians; made his way up 'a great river called Chretes' (probably the Senegal); and after having 'sailed by streams of fire,' came to 'a bay which is called the Southern Horn,' and which has been identified with Sherboro Sound, to the south of Sierra Leone. Scarcity of provisions prevented him from sailing farther to the south. (See Mer, *Mémoire sur le Périple d'Hannon*, Paris, 1885.) About the same time Himilco is said to have explored parts of the northern coasts of Europe, but regarding this voyage we have no trustworthy information. In 525 B.C. Carthage would in all likelihood have been destroyed by Cambyses but for the refusal of the Phœnicians, who formed part of his fleet, to act against their kinsmen. By the first treaty between Carthage and Rome (509 B.C.) the Romans were restricted from sailing beyond the Fair Promontory (probably Cape Bon)—a provision probably designed to exclude them from Spain, with which Carthage had a great commerce—while the Carthaginians were forbidden to injure any Latin city, even though it should not happen to be subject to Rome. A later treaty, of which the exact date is unknown, imposed harder conditions on the Romans, whom it debarred from trading in Africa and Sardinia, while it permitted the Carthaginians to attack Latin cities not under Roman rule. It forbade them, however, to make any settlement in Italy.

From the beginning of the 5th century B.C. to the date of the city's downfall, the history of Carthage is the history of a struggle for supremacy between the Semitic and the Aryan races—a struggle waged first by the Canaanite and the Greek, and then by the Canaanite and the Roman. The Græco-Phœnician wars were fought for the possession of Sicily, an island only a hundred miles distant from Carthage, and 'the natural bridge between Italy and Africa.' On the outbreak of the Persian war, the Carthaginians determined to annex Sicily at a time when its Greek colonists could receive no aid from the parent cities. In 480 Hamilcar landed on the island with a motley force of Phœnicians, Libyans, Iberians, Corsicans, Sardinians, and Ligurians, said—but probably with exaggeration—to have numbered 300,000 men. Gelon of Syracuse, with 55,000 men, met the invaders at Himera, where Hamilcar was slain and his army cut to pieces. This great victory is said to have been won on the same day as the battle of Salamis. Seventy years elapsed before the Carthaginians renewed the struggle. In 410 B.C. Hannibal, a grandson of Hamilcar, invaded Sicily with 100,000 men, and after massacring the people of Selinus, captured Himera, and there offered up 3000 captives as an expiatory sacrifice to the spirit of Hamilcar. Another expedition was despatched from Carthage in 406 B.C., and in 396 B.C. Himilco blockaded Syracuse, the last of the great Hellenic cities in the island which remained unconquered. But pestilence having broken out among the besiegers, Dionysius, the tyrant of Syracuse, fell upon their camp, and only a fragment of their army escaped to Africa. The struggle went on until the death of Dionysius, success inclining now to one side, now to the other. Then there was peace for twenty years, during which the power of Carthage steadily waxed in Sicily. So formidable did she become, that in 344 the Syracusans appealed to Corinth, their mother-city, for aid against her. The Corinthians sent them 700 mercenaries under Timoleon. With 6000 men Timoleon routed a host of 70,000 Carthaginians as they were attempting to cross

the river Crinessus (339 B.C.); a second Greek victory followed; and the tide of Semitic invasion was rolled back. Carthage sued for peace, and the contest was not renewed until 309 B.C., when Syracuse, under the rule of the tyrant Agathocles, was rent by civil dissensions. Hard pressed at home, Agathocles formed the audacious design of falling upon Carthage while her forces were mainly in Sicily. Eluding the Carthaginian fleet, he landed in Africa, gained victory after victory, and carried the war up to the walls of Carthage. But his presence being urgently required in Syracuse, he had to leave his son Archagathus in charge of the army. Archagathus proved incompetent. On the return of his father a mutiny broke out; Agathocles fled to Sicily, and his troops made peace with Carthage. The Græco-Phœnician wars came to an end with the Sicilian campaigns of Pyrrhus, king of Epirus. That monarch, one of the greatest generals of antiquity, projected the conquest of Carthage, but wasted his strength in a futile contest with Rome, and after leading the Greeks of Sicily with varying fortune against the Carthaginians, was forced to quit the island in 276 B.C.

The first of what are known, from the Latin word *Punicus*, 'Phœnician,' as the Punic Wars began in 264 B.C. The conquest of Southern Italy by Rome had brought face to face the two rivals for supremacy in the Mediterranean world. The Mamertines, a body of Campanian mercenaries who had served under Agathocles, sought and obtained Roman aid against Syracuse and Carthage. The Romans won two great sea-fights at Mylæ (260 B.C.) and at Ecnomus (256 B.C.), and Regulus carried the war into Africa, where he was defeated and his army almost annihilated by the Carthaginians under the command of the Spartan Xanthippus (255 B.C.). In Sicily the Romans were for a time baffled by the consummate generalship of the great Hamilcar Barca, who defied all efforts to dislodge him from the stronghold of Eryx. But he received no adequate support from Carthage, and a naval victory won by Rome at the Ægates Islands brought the war to a close in 241 B.C. Carthage gave up all claim to Sicily, and paid an indemnity of nearly £800,000. But Hamilcar marched out from Eryx with all the honours of war. The Carthaginian mercenaries then mutinied, and were supported by the Libyan tribes. After a bloody struggle which lasted from 241 to 236 B.C., the rebellion was crushed by Hamilcar. That great general then determined to build up an empire in Spain which would compensate for the loss of Sicily and furnish an admirable recruiting ground in the struggle with Rome, of which he foresaw the renewal. He crossed into Spain in 236 B.C., and before his death in 228 B.C. he had by arms and diplomacy extended the sway of Carthage over a great part of the peninsula. His work was ably carried on by his son-in-law, Hasdrubal, who was remarkably successful in conciliating the Spaniards. Hasdrubal was assassinated in 221 B.C., when Carthage held all Spain up to the Ebro.

On the death of Hasdrubal the troops chose as their leader Hannibal, the son of Hamilcar, the greatest of all the Carthaginians, and 'the greatest captain that the world has seen.' In 219 B.C. Hannibal captured the town of Saguntum, a city in alliance with Rome. The Romans, who had long been jealous of the progress their rivals had made in Spain, thereupon declared that the treaty was broken, and the Second Punic War began. That war is in this work dealt with in the articles HANNIBAL and ROME. It was, as Arnold has said, the war of a man with a nation; no other war shows so impressively what the genius of a

single man can achieve. The campaigns of Hannibal are the most wonderful in all history. Here, however, it must suffice to say that he led his men from the Ebro to Italy; that he had himself in a great measure to create the far inferior forces with which, in battle after battle, at the Ticinus and the Trebia, at Trasimenus and at Cannæ, he broke and drove the legionaries, the best soldiers of the ancient world; that he brought Rome to the verge of ruin, and that his victories would, in all likelihood, have been crowned by her capture had he been duly supported from home. But his countrymen were unworthy of the great Carthaginian. After having maintained himself in Italy for fifteen years, he was recalled in 203 B.C. In 202 B.C. Publius Cornelius Scipio invaded Africa and won the battle of Zama. Peace was then concluded. The Carthaginians were forbidden to make war on any state without permission of the Romans. They were compelled to give up all war-ships except ten, and to pay an indemnity of ten thousand talents and an annual tribute of two hundred.

In the years between the Second and the Third Punic Wars, Massinissa, king of Numidia, made repeated aggressions on Carthage. The Carthaginians appealed in vain for justice to the Romans, who had resolved on the destruction of the city, and who declared war in 149 B.C. Carthage fell in 146 B.C. It was taken by Publius Cornelius Scipio Æmilianus after a siege of two years. For six days the fighting went on in the streets of the city, the people, men and women, defending their houses with a fierce determination which recalls the resistance of the Jews in the siege of Jerusalem by Titus. The city was razed to the ground, and the country became a Roman province. At the time of the siege Carthage is said to have had 700,000 inhabitants.

Carthage was to rise again as a Roman city, but her capture by Scipio closes her history as the capital of a Phœnician state and the centre of a vanished civilisation. Our knowledge of that civilisation is meagre and vague in the extreme. And it must be remembered that what we do know of Carthage is derived from her implacable enemies. To the Greeks the Carthaginians seem to have been more repugnant than any other 'barbarians.' With the Romans 'Phœnician' was synonymous with all that is cruel and treacherous. Yet, were it not for Greek and Roman writers we should know nothing of Carthaginian history. In reading that history, wide allowance must be made for the fact that no Carthaginian version of it has come down to us. Still, even when that is done, it is hardly possible to follow with sympathetic interest the fortunes of Carthage apart from those of the great family of Barca. Her people were bold and skilful sailors, and the most industrious and enterprising of merchants. She produced several men of high practical ability, and one man of incomparable military genius. But her people had not the qualities of an imperial race. A nation of traders, they trusted in war principally to mercenaries; it was seldom that native Carthaginians, save in times of acute peril, formed any considerable part of the army. Their rule was peculiarly oppressive, and their subjects were at all times ready to rise against them. In the struggle with the Greeks they committed the bloodiest atrocities. Their civilisation seems to have been wholly material; they had apparently no artistic genius; their religion was the most hideous ever practised by a people emerged from barbarism. Their overthrow by Rome was, it can hardly be doubted, a gain to mankind. Still, it must never be forgotten that it was in this strange Canaanite people, 'alone of barbarian nations, that Greece and Italy found real instructors, worthy rivals in commerce, policy, and warfare' (Freeman).

Like other Canaanites, the Carthaginians practised a horrible form of fire-worship. Their chief god was Moloch or Baal-Hammon, who represented the destructive power of the sun. In his temple there burned a furnace into which human victims were cast. These were generally captives taken in war, but in times of extreme peril native Carthaginians were also sacrificed; when Agathocles besieged the city, it is said that 200 children belonging to the noblest families were slain to propitiate the god. The moon-goddess, Ashtaroth, the Greek Astarte, was worshipped under the name of Tanist. Melkart, who corresponded to the Greek Hercules, was held in special honour, and missions with offerings were sent at regular intervals to his great temple at Tyre. A sea-god, whom the Greeks identified with Poseidon, was in all probability the same as the Philistine fish-god Dagon. Another deity named Esmun seems to have presided over healing. Religious honours were paid to deified heroes; to certain genii or spirits; to various animals—among them the lion, the bull, and the serpent—and to several of the Greek divinities, with whom the Carthaginians became acquainted in Sicily. There appears to have been an order of priests, but sacrificial rites were performed by the generals and the principal magistrates.

The constitution was oligarchical. The two chief magistrates were called by the Romans *suffetes*, a corruption of a Canaanite word corresponding to the Hebrew *shophetim* or 'judges.' The *suffetes* were chosen from the members of certain distinguished families. The tenure of office is uncertain; some seem to have been elected annually, others for life; but they could not lead an army or a fleet unless specially appointed to the command. The senate contained an inner council of a hundred, which seems to have been the chief executive power in the state. It exercised a jealous supervision over the generals, who had on returning to the city to submit reports of all their transactions to its members. There was also an assembly of the people, which seems, however, to have had very slight political influence. According to Aristotle, the state officials were unpaid. So far as can be ascertained, justice was administered by special courts. The oligarchy seems to have been invariably rent into factions, and corruption was rife during at least the later period of Carthaginian history. An immense revenue was necessary to maintain the navy and mercenaries. It was drawn from heavy customs duties levied on imported goods, from the tribute paid by other Phœnician cities and the subject African tribes, and from rich mines worked by the state in Corsica and Spain. The contributions in kind were partly transmitted to Carthage, partly stored up in the provinces for the service of the army. The state could without difficulty send out a force of 100,000 troops. The fleet which was defeated at Ecnomus numbered 350 ships, and had 150,000 men on board. The commerce of Carthage was not confined to the Mediterranean ports. Her ships sailed as far west at least as the Azores, as far north as Britain and the Baltic; and she carried on an immense trade with the interior of Africa. Some of her caravans pushed across the Sahara to the basin of the Niger; others journeyed regularly between Thebes, in Egypt, and the Strait of Gibraltar, following a route with fixed stations for halting, which are carefully set down by Herodotus. Slaves, gold, ivory, and precious stones were the staple of the African trade. Wine, cattle, iron, fruit, &c. were imported from the Mediterranean countries. Spain and Sardinia furnished silver; Corsica, slaves; Britain, tin and copper; the Baltic, amber. A considerable overland trade was carried on through Spain with the Gallic tribes, as the

Massilians would not allow trading stations to be established on the southern coast of Gaul.

The Carthaginians had no aptitude for art—even their coins bear the impress of Greek design and workmanship—and if they had a literature it has perished. When the city was taken by Scipio, the contents of its libraries, which may have been principally Greek works, were dispersed and lost. A single book, a treatise on agriculture, ascribed to one Mago, was preserved and translated into Latin by order of the Roman senate. Cicero speaks of this work (*De Re Rustica*) as being in his day the standard authority on its subject. Himilco is said to have written an account of his voyage to the north-western shores of Europe, and, according to Livy, Hannibal wrote a history of his own campaigns. A corrupt form of the Carthaginian or Canaanite language was spoken in parts of North Africa in the days of Augustine, who was struck by the close resemblance which it bore to Hebrew.

Some twenty years after the destruction of Carthage, Caius Gracchus endeavoured to found a Roman colony on her site. This scheme, which at first ended in failure, was carried out by Augustus, in accordance with the intentions of Julius Cæsar. In the 3d century A.D. the new Carthage had become one of the chief cities of the empire. It figured conspicuously in ecclesiastical history, being the scene of several important councils and synods. At a church conference held there in 411 A.D. the suppression of the Donatists was decreed; and the Pelagian heresy was condemned by a council of Carthage held in 418 A.D. The city, which was seized by Genseric in 439 A.D., became the capital of the Vandal kingdom of Africa, and 'after an interval of six centuries, the fleets that issued from the port of Carthage again claimed the empire of the Mediterranean' (Gibbon). The Vandal kingdom was overthrown by Belisarius, who took Carthage in 533 A.D., and named it Justiniana. The city, which Heraclius at one time proposed to make the capital of the empire, was destroyed by the Arabs under Hassan, governor of Egypt, who conquered part of Northern Africa for the Khalif Abd-al-Melik in 692-98 A.D.

See the histories of Rome; Bosworth Smith, *Carthage and the Carthaginians* (1879); Perrot and Chippiez, *Art in Phœnicia* (trans. 1885); Davies, *Carthage and her Remains* (1861); Hennebert, *Antibal* (Paris, 1870-78); Church, *Carthage, or the Empire of Africa* (1886); Meltzer, *Geschichte der Karthager* (1879-1913); Acton Macdonald, *Massilia-Carthago* (1897); A. Graham, *Roman Africa* (1902); Miss Moore, *Carthage of the Carthaginians* (for excavations, &c., 1905); Douglas Sladen, *Carthage and Tunis* (1906); Petrie, *Tunis, Kairouan, and Carthage* (1908); S. Gsell, *Histoire Ancienne de l'Afrique du Nord* (1913 et seq.). Among ancient writers, the chief authorities on Carthage are Polybius, Diodorus Siculus, and Livy. Flaubert's *Salammô* is a vivid picture of ancient Carthaginian life, marvellously learned in details and illumined with genius. The site has been excavated by Delattre and others. In 1923 American subscribers guaranteed a large sum for more extensive digging. For legendary history, see DIDO.

Carthagena. See CARTAGENA; and for Carthagena Bark, see CINCHONA.

Carthamine, or CARTHAMEINE. The dye so called is obtained by a chemical process from *Carthamus tinctorius*, or Safflower (q.v.), in crystals which are insoluble in water, slightly soluble in ether, and which with alcohol readily form a purple-red solution. When newly precipitated, carthamine immediately and permanently attaches itself to cotton or silk (but not to wool), requiring no mordant. It dyes the fabric a fine red, which is changed to yellow on the addition of alkalies, and may be returned to red again on being treated with acids. The safflower contains about 5 per

cent. of carthamine, and also about 25 per cent. of a yellow colouring matter called safflower-yellow, which, however, is of no value in dyeing.

Carthusians, a monastic order which owes its origin to St Bruno, who retired c. 1086 with six companions to the solitude of La Chartreuse (q.v.—hence the name), where they built hermitages, wore rude garments, and lived upon vegetables and coarse bread. In 1134 the fifth prior, Guigo, composed a body of rules, called the *Statuta Guigonis* or *Consuetudines Cartusie*, but they have been often changed. After 1176, when the order received papal approbation, it extended rapidly. It dates from c. 1170 in England, where the name of Chartreuse was corrupted into Charterhouse (q.v.). The Carthusians were divided into two classes, fathers (*patres*) and brothers (*conversi*). Each occupied a separate cell, with a bed of straw, a pillow, a woollen coverlet, and the means of manual labour or of writing. They left their cell, even for meals, only on festivals and on days of the funeral of a brother of the order. Thrice a week they fasted on bread, water, and salt, and there were several lengthened fasts in the year. Flesh was forbidden at all times, and wine, unless mixed with water. Unbroken silence, except on rare occasions, was enforced, as well as frequent prayer and night-watching. These austerities were continued, with little modification, by the modern Carthusians. The order at one time counted 16 provinces, and boasted some of the most magnificent convents in the world—as La Grande Chartreuse, near Grenoble, and Certosa, near Pavia. They were given to hospitality and works of charity, and were on the whole better educated than the mendicant orders. Their principal seats were in Italy, France, and Switzerland; but they have shared the fate of the other monastic establishments, and their convents are now for the most part solitudes indeed. The monastery at Parkminster, Sussex, was founded by exiles from Chartreuse (q.v.).—The Carthusian nuns (1229) followed the Carthusian rules, with some mitigations.

Cartier, JACQUES, a French navigator, discoverer of the St Lawrence, born at St Malo, 31st December 1494, between 1534 and 1541 made three voyages of discovery to North America (see CANADA). He returned to St Malo, and died 1st September 1557. See *Lives* by Longrais (1888) and Phinney Baxter (1906).

Cartilage, or GRISTLE, is a firm elastic substance, of a pearly whiteness, presenting to the unaided eye a uniform and homogeneous appearance. Cartilages may be divided into the *temporary* and the *permanent*. The *temporary* cartilages are substitutes for bone in the earlier periods of life, and after a certain time become ossified. At birth the extremities and larger eminences of the long bones and the margins of the flat bones are still cartilaginous, and this cartilage does not altogether disappear till the period of puberty. The *permanent* cartilages are either *articular* or *non-articular*. *Articular* cartilages are attached to the extremities of bones, and enter into the formation of joints. *Non-articular* cartilages are usually more flexible than the articular. They are sometimes attached to bones to lengthen them out, as, for instance, the costal or rib cartilages which form a considerable part of the framework of the thorax, and impart elasticity to its walls. They are present in the nose, the auditory canal, and the Eustachian tube. In other cases they form the basis of distinct organs, as the larynx, the trachea, and the eyelids. The physical properties of cartilages, especially their elasticity, resisting power, and incapability of extension, are such as to fit them admirably for the functions which they have

to perform in the animal economy. See CELL, BONE, LARYNX; and for the chemical constituents, see ANIMAL CHEMISTRY, GELATINE, and GLUTEN. Cartilage is liable to inflammation, to ulceration, and to ossification; for the diseases of the larynx, see that article.

Cartilaginous Fishes, a designation which may be usefully restricted to that sub-class of fishes to which sharks and skates belong, and to which the technical titles of Elasmobranchii and Chondropterygii are usually applied. It is true that the double-breathing Dipnoi and many of the Ganoids are in great part cartilaginous, but there is no possibility of confusing either of these sub-classes with the Elasmobranchs. Similarly the cartilaginous round-mouths, or Cyclostomata (see HAG, LAMPREY), are quite apart from ordinary fishes—e.g. in the absence of jaws, limbs, and scales, and presence of an unpaired nasal canal and purse-like gills.

General Characters.—In these lowest fishes, then, the skeleton is gristly or cartilaginous, and the teeth and scales are (with the exception of slight hints in the vertebral column) the only bony structures. The skin bears skin-teeth (dermal denticles) or the so-called placoid scales, tipped with enamel, cored with tooth-substance or dentine, and based with bone. There is no gill-cover (*operculum*) over the gills, and the slits from the throat, usually five in number, open directly to the exterior. The gill-filaments are attached to either side of the partitions between the gill-slits. An anterior gill-slit, ahead of the usual five, usually opens on the dorsal surface behind the eye, bears only a trace of a gill, and is known as the spiracle. The ventricle of the heart has an anterior contractile portion, known as the *conus arteriosus*, which leads on into the vessel taking impure blood to the gills. The hind-fins are situated far back, and bear accessory clasping organs in the males. The intestine has a spiral fold running down it internally, known as the 'spiral valve.' The air-bladder is almost always entirely absent, but rudiments of it are sometimes seen. The eggs are usually laid in horny cases, such as the mermaid's purse of the skate; but not a few forms are viviparous—that is to say, the eggs develop in the oviducts. The embryos bear external gills. The Elasmobranchs are marine, and voraciously carnivorous in their diet.

History.—The cartilaginous fishes are undoubtedly the most primitive existing forms, and are of special interest on that account. The cartilaginous nature of their internal skeleton was obviously unsuited for fossil preservation, and thus their earliest records are limited to the bony scales and teeth. The oldest traces are found in the Upper Silurian, and are preceded by the armoured ganoid Pteraspis. They are scanty in the Devonian, but profuse in the Carboniferous, and become predominant among fishes in the Jurassic period. They retain this ascendancy throughout Tertiary times. One of the most ancient living representatives is the deep-water frilled shark (*Chlamydoselachus*). It has pronged teeth like the 'cladodonts' of the Middle Devonian, an anterior mouth, two dorsal nostrils, a large free opercular fold, six gill-clefts, and a slightly bent-up asymmetrical tail.

Classification.—A divergent offshoot from the main tribe is represented by the Holocephali (with a single gill-opening and jaws firmly fixed to the skull), including the two genera *Chimæra* (King of the Herrings) and *Callorhynchus*. All the other members of the sub-class have 5 to 7 gill-openings and jaws movably attached to the skull. They are often designated Plagiostomata, or cross-mouthed, for the mouth lies as a transverse slit on the under side of the head. They are conveniently distinguished into two sub-orders—(a)

Selachoides—shark-like forms, and (b) Batoidei—skate-like forms. In the former the gill-openings are lateral, and the body more or less cylindrical; in the latter the gill-openings are ventral, and the body flattened. Sharks, dog-fish, monk-fish or angel-fish, illustrate the first sub-order; skates, rays, torpedos, and sting-rays the second.

Cartography. See MAP.

Cartoon, a design on strong paper of the full size of a work to be afterwards executed in fresco, oil-colour, or tapestry. The design when completed is transferred, by tracing or pouncing, to the surface finally to be worked on. The most famous cartoons are those of Raphael (q. v.).

Cartouch (Fr. *cartouche*, Ital. *cartoccio*, 'a roll of paper'; *cartridge* is a mere corruption), formerly a name for a portable wooden case for holding cannon-balls or musket-bullets. A gun cartouch now means merely a waterproof canvas case for holding the cartridges of a field battery, one to each ammunition-box. The cartridge-box carried by the soldiers used to be called a cartouch in England, and still is in France.

Cartouche, the name given by Champollion to the ovals on monuments and in papyri on which the hieroglyphic characters for the names of Egyptian kings are inscribed. In architecture, cartouche signifies a tablet, either for ornament or to receive an inscription, so formed as to resemble a sheet of paper or parchment, with the edges and ends rolled up. The same term is applied to modillions, or brackets supporting a cornice, and, in heraldry, to the oval escutcheon of an ecclesiastic.

Cartridge. The word is a corruption of the French *cartouche*, meaning a paper case, and originally denoted solely the charge of gunpowder, contained in a bag, for a cannon. Such a cartridge is shown in fig. 1; but the word has now a much more extended meaning, and covers all the articles shown in figs 1 and 2, and in figs. 6 to 9.

Fig. 1 shows a cartridge practically identical with that used, at least, as long ago as 1560 for shotted guns, and with that often used to-day. A woollen material, such as flannel or serge, is used for the bag, being less liable to leave smouldering fragments in the gun than linen or cotton, and the need of a very strong material for the large charges of gunpowder used latterly for heavy guns led to the adoption of a



Fig. 1.

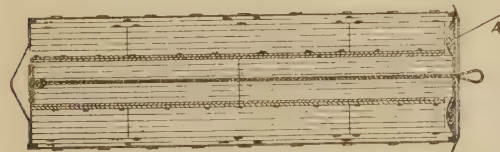


Fig. 2.

coarse silk cloth. Gunpowder cartridges have varied in weight, from a few ounces to about 100 lb. The largest total charge for a gun ever used in the British (and probably any other) service was the 960-lb. charge for the 16.25-inch gun of 110 tons, firing a projectile of 2000 lb. It was made up in eight cartridges.

Fig. 2 shows a modern cartridge of smokeless explosive in cord or tube form. At one end it has a priming of gunpowder (A) which, being placed

next the vent, is fired first by the tube (see below). Modern smokeless explosives are difficult to ignite, and to get regular ignition such a priming is usually required. (For cordite and other smokeless powders, see under GUN-COTTON.) The cordite charge for the British 15-inch gun weighs 428 lb., and is made up in four cartridges.

Cartridges in early days were fired by 'priming' the vent with fine gunpowder, and igniting the priming by a red-hot iron or smouldering slow match. They are now fired by *tubes* inserted in the vent.

Fig. 3 shows in section a 'friction' tube, made of copper tubing filled with gunpowder. On pulling out the friction bar (A), the friction composition (B) round it is fired, and thereby the gunpowder charge (C). The ball in the mouth of the tube pierces the cloth of the cartridge-bag. When the cartridge fires, the gases generated blow the fired tube out of the vent, and this backward rush of gas destroys the vent channel so rapidly that modern tubes, now to be described, are held firmly in, and seal, the vent when the cartridge fires (see BREECH-LOADING). These tubes are made of brass. With the 'percussion' tube, shown in fig. 4, a hammer strikes the plunger (A), and so fires the percussion-cap (B)

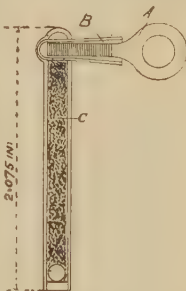


Fig. 3.

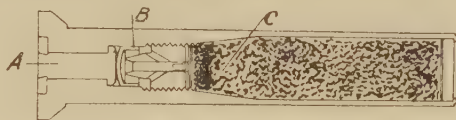


Fig. 4.

and gunpowder (C). The electric tube (fig. 5) is fired by passing an electric current, as shown

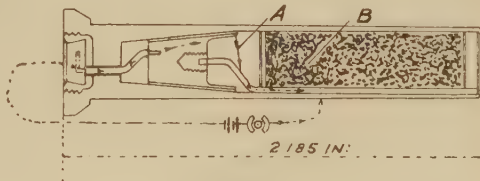


Fig. 5.

diagrammatically by the dotted lines and arrows, and so rendering the thin wire 'bridge' (A) red-hot, thereby firing the priming in which it is embedded and the gunpowder (B).

Fig. 6 shows in part section a cartridge for a quick-firing gun (see CANNON). It consists of a brass case, carrying, fixed permanently in its mouth, the projectile, and filled formerly with gunpowder, but now with smokeless explosive. At its base, in a removable 'primer,' is a percussion-

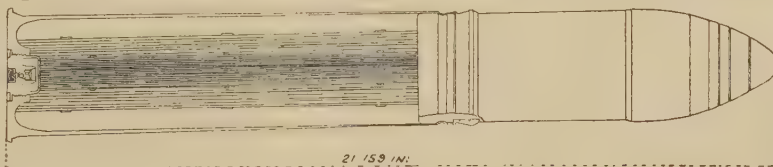


Fig. 6.

cap and a small charge of gunpowder. For quick-firing guns larger than about a 25-pounder, the

weight of such a cartridge becomes inconveniently great, and the projectile and case are loaded separately.

Fig. 7 shows the cartridge for the British '303-inch rifle. The case is of brass, the cordite charge weighs about 38 grains, and the 'enveloped' bullet

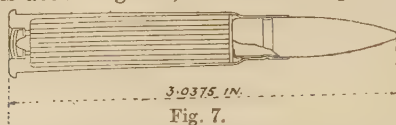


Fig. 7.

174 grains. Except that a grain-powder is used more commonly abroad, and was used by Great Britain to a considerable extent during the war of 1914-18, and probably will be in the future, it



Fig. 8.

represents in essentials the cartridge of any military rifle. Replacing the sharp-pointed bullet by one of the form shown in fig. 8 (the hollow in the nose of which is intended to cause the bullet to expand on impact), we have the sporting cartridge, for use against soft-skinned animals, now very generally adopted. In the so-called 'express' sporting rifles, which fire a much larger and heavier bullet than the small-bores at a much lower velocity, a plain lead bullet without envelope is used. See RIFLES for the reasons necessitating the use of an envelope.

Fig. 9 shows a sporting-gun cartridge. It consists of a stout paper cylinder with a metal base

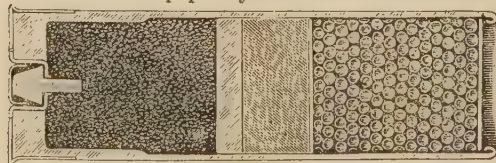


Fig. 9.

carrying the percussion-cap. The details of filling are clear from the illustration. Sometimes paper is replaced by thin brass.

Pistol cartridges are similar to rifle cartridges, but much shorter. In some the detonating composition, usually held in a cap, is contained in the rim of the case.

Cartridge-paper, a light-coloured strong paper, originally manufactured for cartridges, is extensively used in art, its rough surface being useful for certain kinds of drawing.

Cartwright, EDMUND (1743-1823), the inventor of the power-loom, was born at Marnham, Nottinghamshire. Educated at Oxford, he obtained the rectory of Goadby-Marwood, Leicestershire (1779), where on his glebe-land he made improvements in agriculture. A visit to the cotton-spinning mills of Arkwright in Derbyshire directed his attention to new methods of weaving. The result in 1785 was the power-loom. At Doncaster he set up a factory, in which his power-loom was used, but, owing to opposition and expense, had to give up business. A mill at Manchester with four hundred power-looms was burned down. It was not till the beginning of the 19th century that the power-loom came into practical use. In 1790 Cartwright took out a patent for combing wool, and secured patents for various other improvements in connection with manufactures. He even joined Robert Fulton in his experiments for applying steam to navigation. All these efforts brought him no direct gain, but in 1809 government granted him £10,000. He wrote some verse.

Cartwright, JOHN (1740-1824), the 'Father of Reform,' was a brother of the preceding. At eighteen he entered the navy, saw some service

under Howe, and in 1766 was gazetted first-lieutenant of the *Guernsey*, on the Newfoundland station. He returned in 1770, and was appointed in 1775 major to the Notts militia. He now began to think and write on political questions, and found himself unable to take service under Lord Howe in North America. From the beginning he advocated annual parliaments, vote by ballot, and manhood suffrage, and throughout his busy life he advocated with equal ardour causes so different as reform in farming, abolition of slavery, the foundation of a Valhalla for English seamen, the improvement of national defences, and the liberties of Spain and Greece. Cartwright was fined £100 for sedition in 1820.

Cartwright, PETER (1785-1872), an eminent Methodist preacher, born in Virginia, was ordained in Kentucky in 1806, and in 1823 removed to Illinois, where he laboured for nearly half a century. He also sat in the state legislature there, and in 1846 was defeated by Abraham Lincoln in an election for congressman. See his *Autobiography* (1856) and *The Backwoods Preacher* (Lond. 1869).

Cartwright, THOMAS, Puritan divine, was born in Hertfordshire about 1535. He was compelled to quit Cambridge owing to his attachment to the Reformed doctrines, but returned on the death of Mary. He retired to Ireland (1565-67), and after his return in 1569 he was chosen Lady Margaret Divinity professor. His lectures here were too honestly critical of the polity of the church to be acceptable to the chief authorities, who, led by Whitgift, deprived him of his professorship, and subsequently of his fellowship. He travelled on the Continent, and on his return to England in 1572 he again became embroiled with the church and the government, and for his nonconformity suffered imprisonment several times. Again obliged to flee to the Continent, he was for a time pastor of the English church in Antwerp. On his return in 1585 he was once more committed to prison. He was one of the most influential Puritan teachers of his day. He died at Warwick, where he had become master of Leicester's Hospital, 27th December 1603.

Carucate (Lat. *carruca*), probably originally an amount of land such as one team of eight oxen could plough in a season. The *carucage* was a tax on the carucate, first imposed by Richard I. in 1198.

Carúpano, a port of Venezuela, on the north coast of the peninsula of Paria. The surrounding district is fertile, and has mines of copper, sulphur, silver, lead, and lignite; it also exports cocoa, coffee, and fish. Pop. 10,000.

Carus, JULIUS VICTOR (1823-1903), an eminent zoologist, born at Leipzig. He studied medicine and surgery at Leipzig, further at Würzburg and Freiburg, and in 1849 went to Oxford as keeper of the museum of comparative anatomy. In 1851 he returned to Leipzig, and in 1853 became professor of Comparative Anatomy there. Besides works on general zoology, he wrote many elaborate and masterly monographs.

Carus, KARL GUSTAV (1789-1869), a German physiologist and physician, was born at Leipzig. He lectured on comparative anatomy at Leipzig, on midwifery at Dresden, where afterwards he became court physician and councillor of state. He wrote on anatomy, physiology, and allied subjects.

Caruso, ENRICO (1874-1921), M.V.O., a great Italian operatic tenor, born in Naples, sang in Italy, South America, London, New York, &c. He was a Chevalier of the Legion of Honour.

Carvacrol, a phenol isomeric with thymol, with similar properties. It is got from Cyprus origanum (*Origanum dubium*; see MARJORAM) and other labiate plants.

Carvalho. See POMBAL.

Carver, JOHN, born about 1575, was the leader of the Pilgrim Fathers (q.v.), and died at New Plymouth, Massachusetts, in April 1621, within five months of their landing.

Carvin, a town of the French department of Pas-de-Calais, 11 miles SSW. of Lille by rail, with minor manufactures; pop. 10,000.

Carving is generally at its best among people who are striving after a high ideal. In illustration of this we have but to turn to the carvings and sculptures of Assyria and Greece, the work of the Moorish and early Gothic periods, and the Renaissance. In times of luxury, when men's minds generally become relaxed, its chief characteristics are high finish and dexterous execution; but these too commonly speak only of expense and brainlessness, and the further they are carried the more do they evince the want of true artistic perception.

It is noticeable that nowadays there is not an all-pervading spirit among art craftsmen stimulating them to combined effort after one common high ideal, but the prevailing tendency is towards what is generally termed the Renaissance style of work. With this tendency designers and art workmen naturally turn to the examples of the Roman period from which the men of the Renaissance took their inspiration, but which in point of fine design and execution they certainly did not surpass, as the numerous examples in the Vatican and Capitol at Rome can show.

The endlessly varied forms to be found in nature must ever yield the most fruitful suggestions for the study of the carver, but it will depend upon the material he is working with how far he can approximate nature in his representations. In box-wood or lime-tree it is possible to imitate the general form of the rose blossom, while in stone it can only be very partially done. This consideration has all over the field of design been a great factor in determining the character to be imparted to the subject of study, and it is at once apparent that in carving granite its hardness and mottled appearance suggest a broader, stronger treatment than would be suitable for statuary marble. In the treatment of carving for structural work, the scale and spirit of the whole design must necessarily be kept in view, and in all the best styles of architecture a conventional treatment of natural forms is observable; and it is evident that craftsmen in this branch of industry must possess a wide intelligence in the matter of style, that they may handle their work in sympathy with the designer of the whole scheme, be it a building, a monument, or a piece of furniture of any sort.

Some methods are in use for cheapening carvers' work—e.g. in the case of scroll or fretted work in which raised forms are disposed over a smooth ground, the ornament is cut out with a fret-saw and glued to the ground. This is not at all a desirable method of cheapening work, as the process is generally too easily observed by the different colour or texture of the two pieces of wood, and there is the risk of the two woods being affected differently in the course of time by the atmosphere, and separating. Then there is a grounding machine, which has a revolving drill moving over the spaces forming the ground of the ornament. And, lastly, there is what is called a carving machine, which works with one or more drills moving over the work to be carved in correspondence with a tracing point which traverses the surface of an iron model of what is to be carved. After the revolving drill has covered the whole design, the wood block needs a little hand-facing to take out the drill marks. These methods are

useful commercially, where many repetitions of the same object are desired, but a mechanical feeling is apt to show itself, and this is contrary to the spirit of the true carver's work.

A glance at the carvings of India, Persia, Japan, and China, impresses us with the cheapness of labour in these countries, and of the widespread love of this art, as well as of the great perfection that has been attained in it. But the commercial spirit of the age is causing serious deterioration of this long famous industry in these countries, owing to the desire on the part of the natives to produce what will sell in European markets, and also from the wish to produce in a month what formerly would have been a labour of love for a year.

In Great Britain, from the beginning of the 18th century, carving was for long much affected by a style of work which had Grinling Gibbons (q.v.) for its chief exponent. Examples of his art are to be seen in St Paul's and Chatsworth. His work is famous for its wonderful dexterity in carvings of foliage, flowers, birds, busts, and draperies in lime and other white woods. But he shows a free disregard of architectural soberness and conventionality, and impresses one at times with the idea that he desired to exhibit his skill in cutting delicate forms from solid blocks more than in the adornment of architectural work. See SCULPTURE, WOOD-ENGRAVING; works by Bemrose (1880), Miller (1885), F. G. Jackson (1903), and Rowe (1907).

Carwell, MME (LOUISE DE KEROUALLE). See CHARLES II.

Cary, ALICE, American author, born 26th April 1820, near Cincinnati, Ohio, removed in 1852 to New York, where she died 12th February 1871. Her poems, stories, and sketches are graceful and natural, and full of charming pictures of domestic life; and the *Cloverbrook Papers* (2 series, 1851-53), which embrace some of her happiest efforts, are said to be partly autobiographical.—Her sister, PHOEBE, born 4th September 1824, joined Alice in New York in 1852. She published independently several volumes of buoyant, pleasant verse, and contributed a third of the *Poems of Alice and Phoebe Cary* (1850). She died 31st July 1871. See Mrs Ames's *Memorial* of the sisters (New York, 1873).

Cary, REV. HENRY FRANCIS, translator of Dante, was born at Gibraltar in 1772. He was educated at Rugby, Sutton-Coldfield, and Birmingham, in 1790 entered Christ Church College, Oxford, and in 1796 took holy orders. In 1805 he published a translation of the *Inferno*, in 1814 of the whole *Divina Commedia*, a translation remarkable not only for its fidelity but for its force and expressiveness. He afterwards translated Pindar's *Odes* and Aristophanes' *Birds*, and wrote a series of memoirs in continuation of Johnson's *Lives of the Poets*. Assistant-librarian in the British Museum (1826-37), he died 14th August 1844. See the *Memoir* by his son (2 vols. 1847).

Cary, LUCIUS. See FALKLAND.

Cary, SIR ROBERT. See CAREY.

Carya. See HICKORY.

Caryatides (pl. of *Caryatis*, lit. 'a woman of Caryæ'), a name given to female figures, in Greek architecture, when used instead of columns to support an entablature. The traditional account of the origin of the name is that the inhabitants of Caryæ, a city in Arcadia, having joined the Persians after the battle of Thermopylæ, the Greeks, after their victory over the Persians, destroyed the town, slew the men, and carried the women into captivity. As male figures representing Persians were already used for this purpose, it occurred to Praxiteles, and other Athenian artists, that female

Caryatides, in their national costume, might be thus employed to commemorate the disgrace of their country. Male figures used for the same purpose are called Atlantes (q.v.). The caryatides which form the portico of St Pancras Church (1822) in London are a reproduction from the Erechtheum on the Acropolis at Athens.



Caryatis :

From Villa Strozzi, on Appian Road—height, 7 feet 10 inches.

Caryocar, a tropical American genus of large trees of the order Caryocaraceæ or Rhizobolaceæ. They yield good timber for shipbuilding, and the so-called *Butternuts* or *Souari nuts*.

Caryophyllaceæ, a natural order of archichlamydeous dicotyledons, containing about 1300 known species, mostly herbaceous plants, a few half shrubby, easily recognised by their opposite, usually entire leaves, stem often swollen at the joints, and placentation free central, at least at maturity. The inflorescence (q.v.) is a dichasial cyme. In the restricted sense, the order is divided into Silenææ, with calyx united, and Alsineæ, with sepals separate. Many of the former produce beautiful flowers—e.g. pink, carnation, sweet-william, lychnis, &c.; but the latter and lower group are largely inconspicuous weeds—chickweed, spurrey. Some botanists separate the Illecebraceæ, or Paronychiaceæ, from the order. The Caryophyllaceæ are mostly natives of temperate and cold countries in the Old World. Almost all are insipid and inert; a few contain *saponine*, and afford a substitute for soap. See SOAPWORT.

Caryophyllus. See CLOVES, MYRTACEÆ.

Caryopsis, in Botany, a fruit in which the seed and pericarp are inseparable. The grain or fruit of grasses, as wheat, barley, rye, maize, &c., is a caryopsis.

Caryota, a genus of lofty palms, natives of the East Indies, easily recognised by their remarkable twice pinnate leaves. One species, *C. urens*, remarkable for the acidity of its fruit, which produces a burning sensation when its pulp is applied to the skin, is also highly valuable for the great quantity of sap (*toddy*) which flows from its wounded spathes, sometimes, in the hot season, to the amount of 100 pints in twenty-four hours from a single tree. Sugar (*jaggery*) is made from this juice by boiling it down, and on this account this palm is sometimes called the Jaggery palm. The 'cabbage' is eaten. The pith yields a kind of sago. The outer part of the stem is very hard, and applicable to many purposes. The fibres of the leaf-stalks are twisted into ropes, the leaf-stalks make fishing-rods, and the woolly substance found at their base is used for caulking ships.

Casabianca, LOUIS, a French naval officer, born at Bastia about 1755, sat in the National Convention of 1792, and in 1798 was captain of the flagship *L'Orient* in the expedition to Egypt. He was mortally wounded at the battle of the Nile, August 1, 1798; the ship caught fire; his ten-year-old son would not leave him, and both (contrary to Mrs Hemans's version of the story) were floating on the wreck of the ship's mast when the final explosion took place.

Casablanca, chief port of Morocco, on the Atlantic, 162 miles SW. of Fez. Wool, cereals,

skins, eggs, &c. are exported; sugar, cotton, &c. imported. The town was bombarded and occupied by the French in 1907, and in 1908 an arrest there led to a dispute between Germany and France, settled by the Hague Court, 1909. Pop. 100,000 (including 40,000 Europeans).

Casale, a city of N. Italy, on the Po, 21 miles NNW. of Alessandria, with a cathedral and manufactures of silk. In 1474 it became the capital of the marquisate of Montferrat (q.v.). Pop. 20,000.

Casalpusterlengo, a town of Northern Italy, 22 miles SE. of Milan by rail, with a large trade in cheese; pop. 7000.

Casamicciola, a favourite watering-place on the island of Ischia, beautifully situated in a valley on the north side of Monte Epomeo, with hot springs (158° F.), baths, hotels, &c.; population, 4000. The season extends from June to September. By the earthquake of 28th July 1883 the place was almost entirely destroyed.

Casanova de Seingalt, GIOVANNI JACOPO, adventurer, was born at Venice in 1725, and by the time he reached his twenty-first year had been abbé, secretary to Cardinal Aquaviva, ensign, and violinist in an orchestra, at Rome, Constantinople, Corfu, and his own birthplace, where he gained some celebrity by curing a wealthy senator of apoplexy. His irregularities drove him from Venice, but after roaming through Northern Italy and France he was back there in 1755, and was then condemned to five years' imprisonment in the 'Piombi.' In fifteen months' time he effected a daring escape, and then for nearly twenty years wandered through Europe, visiting most of its capitals (Paris, London, Berlin, St Petersburg, Madrid, &c.), and making the acquaintance of the greatest men and women of the day, from the pope to Madame de Pompadour, and from Cagliostro to Frederick the Great. Alchemist, cabalist, knight of the papal order of the Golden Spur, and spy, he was everywhere introduced to the best society, invariably excited the disgust or ill-will of those about him, and had always to 'vanish' after a brief period of felicity. In 1761 we find him distinctly professing the miraculous after the Cagliostro fashion: he having undertaken to regenerate old Madame D'Urfé into a young man—for a consideration! In 1785 he established himself with the Count of Waldstein, at his castle of Dux in Bohemia, and there he died (apparently) 4th June 1798. His celebrated *Mémoires écrits par Lui-même* (12 vols. Leip. 1823-38) contain many interesting notices of the manners of his times, intermixed with details of his marvellous adventures. Clever and cynical, they are unmatched as a self-revelation of scoundrelism; Thackeray's *Barry Lyndon* is but a far-off echo. Translations of the *Mémoires* appeared in 1896 and 1922 *et seq.*, an abridged one in 2 vols. in 1923. See books by E. Maynial (trans. Mayne, 1911) and Le Gras (trans. Steuart, 1923).—Two of his brothers were painters—GIOVANNI BATTISTA (1728-95), who in 1764 became director of the Dresden Academy; and FRANCESCO (1727-1805), a battle-painter, born in London.

Casareep, or CASSIRIPE, a sauce or condiment made from the juice of the Bitter Cassava or Manioc root, which also furnishes tapioca. It is in the highest esteem in Guiana, where it is employed to flavour almost every dish; and it is the basis of the favourite West Indian dish called *pepper-pot*. It is a powerful antiseptic, and meat can by means of it be kept for a long time quite fresh, even in a tropical climate. It is made by evaporating and concentrating the juice, which is also mixed with various aromatics. The poisonous principle of the juice is dissipated in the evaporation. See MANIOC.

Casa Santa. See LORETTO.

Casas Grandes, an old Indian town of Mexico, in the state of Chihuahua, 125 miles SW. of El Paso, surrounded with ruins of ancient buildings, which seem to indicate a former population of 20,000 to 30,000.

Casas, LAS. See LAS CASAS.

Casaubon, ISAAC, one of the most famous of the great classical commentators, was born at Geneva on February 18, 1559. His family belonged to Dauphiné. His life was one of incessant study, and he was often hampered in his labours by broken health and narrow means. In his twenty-fourth year he was appointed professor of Greek at Geneva, and in 1586 he married the daughter of the great French scholar, Henri Stephens. He was made Greek professor at Montpellier in 1596, and royal librarian at Paris in 1598. After the death of Henry IV. his position in Paris became insecure on account of his adherence to Protestantism. He accordingly removed in 1610 to London, where he wrote a reply to the *Annals* of Cardinal Baronius, and thereby incurred the charge of having sold his conscience, and become the hired advocate of James I. The accusation was unjust, as he had for many years been unconsciously drawing near to the school of Anglo-Catholic theology. He was made prebendary of Canterbury in 1610; and he died in London on 12th July 1614. He was of a candid and tolerant nature, not gifted with great original powers, but indefatigable in the pursuit of knowledge. He is one of the chief representatives of a school of 16th-century humanists who succeeded to the school of Ciceronians, and with whom wide research took the place of exclusive devotion to style. His treatise *De Satyrica Græcorum Poesi et Romanorum Satira* (1605) and his edition of Theophrastus had far-reaching effects in English and French literature. His other works include *De Libertate Ecclesiastica* (1607), the *Exercitationes contra Baronium* (1614), and editions of Aristotle, Diogenes Laertius, Polybius, Strabo, Theocritus, Athenæus, Persius, Suetonius, &c. Casaubon's power over Greek was limited, but he amassed a wonderfully varied store of learning, and was the first to popularise a connected knowledge of ancient life and manners. His merits as a commentator are best shown in his edition of Athenæus (1600), on which he was engaged for ten years. See *Isaac Casaubon*, by Mark Pattison (1875).—MÉRIC CASAUBON, son of the above, was born at Geneva, August 14, 1599. He accompanied his father to England and studied at Christ Church College, Oxford. He was made prebendary of Canterbury, and vicar of Monckton in Thanet, was deprived of his appointments in 1644, but restored in 1660; and he was ultimately rector of Ickham. He edited the works of Terence, Epictetus, Marcus Aurelius, &c., and vindicated his father in two Latin works. He died at Oxford, July 14, 1671.

Casbin. See KAZVIN.

Cascade Range, a chain of mountains of North America in Oregon and Washington, U.S. (including the Cascade Range Forest Reserve of 7254 sq. miles area), and in British Columbia. It takes its name from the great cascades of the river Columbia, occurring where that stream cañons through the range by a pass 4000 feet deep. The course of the mountain-chain in the United States is from north to south nearly parallel to the Pacific coast-line, and from about 110 to 160 miles distant from it. Southward it is continuous with the Sierra Nevada of California; northward it connects with the unsurveyed range which forms the boundary between British Columbia and Alaska.

The chain throughout most of its course is heavily wooded, chiefly with evergreen conifers, including pines of various species, firs, spruces, cedars, and trees locally known as cypress, larch, juniper, and yew. Southward there is some alder, ash, and maple, and even a little oak. The presence of beautiful cone-shaped and perpetually snow-clad peaks is a most striking feature. There are quite a number of rather low transverse passes which may, in time, become important highways. Near the south end of the range stands Mount Pitt (9760 feet high). Forty miles north is Mount Scott (9127 feet), a mere fragment of a now extinct volcano of enormous dimensions. Its western walls are almost perpendicular. Forty miles still northward, after passing many wonderful old volcanoes and lava-beds, we come to Diamond Peak (8860 feet), which is also the remnant of an old crater-rim. The Three Sisters are of similar character. Mount Jefferson is 10,570 feet high, and Mount Hood 11,760 feet. The principal peaks in Washington are Mounts Tacoma or Rainier (14,530 feet; in eruption in 1894), Adams (12,470), Baker (11,090), and St Helen's (9744 feet). In British Columbia the range comes much nearer the sea-coast.

The Cascade Mountains (at least in Oregon), with the Sierra Nevada, are much more recent than are the Rocky Mountains proper. They were probably formed about the close of the Jurassic period, although the now visible volcanic products seen along the range are of much later, and even quite recent, date; the earliest volcanic fissures being referable to the end of the Miocene period, at which time, or a little earlier, the parallel Coast Range began to be raised.

Cas'cara Sagrada. See BUCKTHORN, CON-STIPATION.

Cascarilla Bark (Span. *cascara*, 'bark'), the tonic and astringent bark of *Croton Eluteria*, a small tree growing in the Bahamas, used in making incense (q.v.) and pastilles. The barks of a number of other species of *Croton* appear to possess similar properties, such as *C. Cascarilla* and *C. Balsamiferum*.

Case, in Grammar. See DECLENSION.

Case, in law. The most common is the 'case stated' by a magistrate raising some point of law for the decision of the Criminal Court of Appeal. This applies to the whole summary jurisdiction of the justices of the peace in England. Such appeals have been allowed in England since 1857; in Scotland only since 1875. Such cases are also stated by way of appeal under numerous special statutes, as the Registration and Customs and Excise Acts. 'Cases' are also the statements and pleadings lodged by the appellants and respondents in the House of Lords. 'Case' is also applied in the Court of Session to the printed argument which is sometimes ordered in cases of difficulty and importance. By authority of statute the courts in different parts of the United Kingdom consult each other as to points of law by means of adjusted cases. One of the points in the celebrated Orr Ewing litigation was whether the word 'cause' in the Treaty of Union meant an actual litigation, or merely a pending question of liability. In the daily language of the courts a 'case' is a previous decision of a court which is supposed to bear upon the subject of argument. The citation of cases was jealously regulated in the Roman law by Valentinian's Law of Citations; now this is left to custom and tradition. In both England and Scotland, by a valuable reform, parties are now encouraged to agree upon facts, and submit their contentions to the court in the form of a 'special case.'

In the United States, while the word case is, like cause, applied generally to every question contested in court, whether of law or equity, it also retains there, in consequence of the state of legal procedure, a limited meaning—e.g. an action of damages for tort, where the older forms are unsuitable, as an action for negligence against a corporation.

Case-hardening is the process of converting the surface of certain kinds of malleable-iron goods into steel, thereby making them harder, less liable to rust, and capable of taking on a better polish. Fire-irons, gun-locks, keys, and other articles of limited size, are very commonly so treated, but the process is sometimes applied to large objects, such as iron railway-bars. The articles are first formed, and heated to redness with powdered charcoal or cast-iron, the malleable-iron taking carbon from either of these to form a skin of steel upon it; the heated objects are then cooled in cold water, or in oil when they are of a delicate nature. Yellow prussiate of potash or parings of leather have also been a good deal used for coating iron articles with steel by heating them together. Some chemists consider that in this case nitrogen combines with the iron and effects the hardening. The coating of steel is very thin, seldom exceeding $\frac{1}{16}$ th of an inch. A Swedish ironmaster discovered that a very excellent case-hardening is obtained by treating iron or steel objects with a mixture of animal matter, such as rasped leather or horn, and arsenious acid dissolved in hydrochloric acid, and heating as usual.

Casein is an organic compound allied to Albumen (q.v.), found in the milk of the Mammalia. There exists in peas, beans, and other leguminous seeds a similar compound, Legumin. The proportion of casein in Milk (q.v.) varies, but averages about 3 per cent., and it may be coagulated and separated therefrom by the addition of a little Rennet (q.v.), as in the manufacture of Cheese (q.v.), or by the employment of a few drops of a mineral acid, such as dilute sulphuric acid. In either case the casein separates as *curd*, which still retains attached to it some oil and earthy salts, though the greater portion of these substances, along with the sugar, remain in the watery liquid or *whey*. The elementary bodies which enter into the composition of casein, and the proportion in which these are present in 100 parts, are—carbon 53.83; hydrogen, 7.15; nitrogen, 15.65; oxygen, 22.52; and sulphur, 0.85. The properties of casein are, that it is not coagulated by heat, as is well evidenced in the heating of milk, but is coagulated on the addition of rennet; sulphuric, hydrochloric, or nitric acids; alcohol, creosote, or infusion of galls, but not by acetic acid. It also forms insoluble precipitates with solutions of the poisonous salts, acetate of lead, nitrate of silver, and bichloride of mercury (corrosive sublimate), and hence the efficacy of taking large doses of milk in cases of poisoning by those deadly salts, as the casein in the milk, forming an insoluble compound with the poison, keeps it from exerting its deadly powers.

The cognate proteinous or nitrogenous *legumin*, generally procured from leguminous seeds, like peas or beans, can also be extracted from the majority of vegetable substances, especially from sweet and bitter almonds, and even from tea and coffee. Dried peas contain a fourth of their weight of legumin, and this can be extracted by bruising the peas to powder, and digesting in warm water for two or three hours. The liquid is then strained through cloth, which retains the insoluble matters, and allows the water with the legumin dissolved therein, and with starch mechanically suspended, to pass through. On settling, the starch falls to

the bottom of the vessel, and the clear liquid holding the legumin in solution, on the addition of a small amount of acetic acid, yields a precipitate of legumin or vegetable casein. So perfectly does the vegetable casein resemble the casein from milk that the one can hardly be distinguished from the other by chemical tests or by taste. In China and Manchuria a form of cheese is made from beans and peas.

Casein is a most important element of food; see DIET, DIGESTION. But the albumen or casein of skim-milk, formerly wasted except when the milk was used for feeding cattle, is now put to a vast number of extraordinarily different uses. It is desiccated and prepared as a substitute for eggs in baking. It is largely utilised in medicinal preparations—especially for nervous disorders—such as sanato-gen and plasmon. Great quantities are used in sizing paper, and for dressing and finishing leather or leather goods. It serves admirably as 'cold' glue. It is the basis of washable distempers and many paints. Casein heated with chalk forms a compound insoluble in water, which, hardening on exposure to air, makes a strong cement. Prepared as a non-inflammable substitute for Celluloid (q.v.), it is manufactured into imitation ivory, pianos, keys, backs of brushes, insulating material for electric fittings, and put to other uses too numerous to specify.

Casemate, originally a loopholed gallery, since called a 'caponier,' from which, without risk of loss to themselves, the garrison of a fort could fire upon an enemy who had obtained possession of the ditch. The term is now applied to any bomb-proof vaulted chamber, in permanent or field fortification, even when used as quarters for the garrison or for covering guns, magazines, stores, or hospitals from high-angle or vertical fire. See FORTIFICATION.

Caserta, a town of Italy, situated on a plain 20½ miles NNE. of Naples by rail. It is chiefly remarkable on account of its magnificent palace, one of the finest in Europe, which was founded by Charles III. of Naples in 1752, and for its 12th century cathedral. Silk is manufactured in the neighbourhood. Pop. 33,500. The province of Caserta has an area of 2000 sq. m., and a pop. (1911) of about 788,400.

Cases, Las. See LAS CASES.

Case-shot, or CANISTER, is an artillery projectile for use at close quarters, and consists of a sheet-iron or tin cylinder filled with bullets varying from $\frac{1}{2}$ an oz. to 3½ lb. in weight, and in number according to the size of the gun. The cylinder is closed by discs of wood, tin, or iron, its walls are strengthened by loose pieces of iron, and the interstices between the balls are packed with shavings and sawdust. On discharge the canister breaks up at once, and the bullets spread over a wide area, but with a low velocity. For this reason they have little effect beyond 300 yards, even on hard open ground, which is best suited to their action. Case-shot is chiefly used in the close defence of works, or against cavalry, and at sea against a boat attack. At long ranges its place is taken by Shrapnel Shell (q.v.).

Cash (old Fr. *casse*, 'a chest for containing money') is sometimes used for money as distinguished from produce, in which sense it includes all immediately negotiable paper—bills, drafts, and bonds, as well as coin and bank-notes. At other times it is used in a limited sense to denote coin and bank-notes, as distinguished from negotiable instruments which pass by indorsation. In the money system in use at the Chinese Treaty ports, *cash* is the name of those coins, of a copper alloy, which are perforated and strung on a thread;

this word is derived from the Tamil *kasu*, a small Indian coin. See TAEI.

Cash Account, or CASH CREDIT, a form of account with a bank, by which a person is entitled to draw out sums as required by way of loan to a stipulated amount. The practice began about 1729 in Scotland, with the banks of which country it is still peculiarly identified. See BANKING, MARGINAL CREDITS.

Cashel, a town of Ireland, in County Tipperary, 100 miles SW. of Dublin and 5 miles SE. of its railway station. It is the see of a bishop of the Episcopal Church, and of a Roman Catholic archbishop. It is irregularly built on the south and east slopes of an isolated height, rising abruptly from a rich and extensive plain. It was a parliamentary borough till 1870, and possesses a barrack, infirmary, and market-house. The ancient kings of Munster resided here. The top of the height, or 'Rock of Cashel,' which rises to about 300 feet, is occupied by an assemblage of the most interesting ruins in Ireland. The ruins consist of a cathedral, founded 1169, burned 1495, and afterwards repaired; a stone-roofed chapel, said to have been built 1127 by Cormac MacCarthy, king of Munster; the palace of the Munster kings; a round tower, 90 feet high and 56 in circumference; and an old cross. At Cashel in 1172 Henry II. received the homage of the king of Limerick, and here he called a council of the clergy, at which decrees were passed for the regulation of the church. Pop. 2800.

Cashew Nut (*Anacardium occidentale*), a tree of the Anacardiaceæ (see TEREBINTHACEÆ), cultivated in both the East and West Indies. It is a spreading tree of no great height. It abounds



Cashew Nut (*Anacardium occidentale*).

in a clammy, milky juice, which turns black on exposure to the air, and is used in India for varnishing, but is so acrid as to produce painful inflammation of the skin. The fruit of the tree is a kidney-shaped nut, about an inch long, seated on the thicker end of a pear-shaped fleshy stalk. The kernel is also surrounded by black acrid oily juice, but is itself pleasant and wholesome. The nuts were formerly sometimes put into old Madeira wine, and are roasted as an addition to chocolate. The fleshy stalk, sometimes called the Cashew Apple, varies in size from that of a cherry to an orange, and is white, yellow, or red. It is perfectly free from acidity, very pleasant, acid, and refreshing. A kind of wine is obtained from

it by fermentation; and from this a well-flavoured spirit can be distilled. A bland gum resembling gum-arabic also exudes from the stem.

Cashgar. See KASHGAR.

Cashiering is a punishment for officers in the army and navy. It is more severe than dismissal, inasmuch as it disqualifies from entering the public service in any capacity. An officer convicted by court-martial of 'scandalous conduct unbecoming an officer and a gentleman' is cashiered.

Cashmere. See KASHMIR.

Cashoubish. See KASHUBISH.

Cash Registers. See CALCULATING MACHINES.

Casia, perhaps *Osyris alba*, a South European shrub of the order Santalaceæ, with pretty little white flowers and small red drupes. Others think the Latin poets meant *Daphne Gnidium*. The name is simply a variant of Cassia (q.v.).

Casilinum. See CAPUA.

Casimir, properly Kazimierz, the name of a number of Polish kings. See POLAND.

Casimir-Périer, JEAN PIERRE PAUL (1847-1907), fifth President of the French Republic, was the son of C. Périer (q.v.), and was born at Paris. He was trained for a political career, but in 1871 was made a Chevalier of the Legion of Honour, for military services rendered during the siege of Paris. Elected a deputy in 1874, and distinguished as a moderate republican of great firmness of character, he was successively under-secretary for instruction and for war, vice-president of the Chamber (1885-93), and president of the Chamber (1893). Premier of France for six months in 1893-94, he was again president of the Chamber, when, on the assassination of M. Carnot (June 1894), he was called to become President of the Republic—an office he resigned in January 1895.

Casino, an Italian diminutive of *casa*, 'a house,' signifies a place for social reunions. The name is usually applied in Italy and the continental watering-places to a place where musical or dancing soirées are held, containing rooms for conversation, billiards, refreshments, &c. In England a dancing saloon is sometimes termed a casino.

Casket. See COFFIN. For the Casket Letters, see MARY, QUEEN OF SCOTS. For the islands called Caskets, see ALDERNEY.

Cáslav. See CZASLAU.

Casoria, a town of Italy, 6 miles N. of Naples by rail; pop. 10,000.

Caspari, KARL PAUL, exegete and church historian, born at Dessau in 1814, became professor of Theology at Christiania in 1857. His Arabic grammar (4th ed. Halle, 1875) is in high repute, and his contributions to the study of the old Testament include works on Obadiah, Isaiah, Micah, and Daniel. Besides his *Kirchenhistorische Anekdoten* (1883), he published at Christiania *Quellen zur Geschichte des Taufsymbols und der Glaubensregel* (2 vols. 1866-69), extensions of which appeared in 1875 and 1879. He died 11th April 1892.

Caspe, a town of Spain, 53 miles SE. of Saragossa; pop. 8000.

Caspian Sea, an inland sea or great salt lake, the largest in the world, on the boundary between Europe and Asia, extending from 36° 40' to 47° 20' N. lat., and 46° 50' to 55° 10' E. long. Its length from north to south is 680 miles, and its breadth varies between 130 and 270 miles. Its total area is estimated at 170,000 sq. m. The coast-line is irregular, and on the east side especially there are several bays and indentations of coast, the principal being those of Mertviy Kultuk (with the bay Kaidak), Kenderli (separated from the above by the

peninsula of Manghishlak), Karabugas, and Balkhan. From the west, the naphtha-impregnated peninsula of Apsheron stretches into the Caspian opposite the Balkhan Gulf and Cheleken Island (also possessing petroleum-wells); Mount Caucasus also rises on its west side. Along the almost unbroken south coast extends a low flat plain from 15 to 20 miles in breadth, and beyond that the lofty Elburz Mountains. On the north the Caspian is bordered by great steppes, the surface of which is below that of the ocean, and the country eastward is occupied by the desert plateau of Ust-urt and the sandy deserts of the Turkomans. During the Post-Pliocene period the waters of the Caspian extended in the shape of a wide gulf north, towards the mouth of the Kama (q.v.), and through a narrow strait between the Balkhan Mountains, over the steppes of the lower Amu-Daria, embodying Lake Aral, whose level at the beginning of the 20th century (*circa* 160 feet above sea-level) was some 250 feet higher than the Caspian's. At a still earlier period it was connected with the Black Sea by the channel of the two Manytch rivers (see CAUCASUS). The Caspian Sea has no tides, but its navigation is dangerous because of violent storms, especially from the south-east. Owing to the variable amount of water brought by its tributaries and the extent of evaporation, its level rises and falls from season to season (highest in July; lowest, December-January) and from period to period. Since 1896, and notably after 1909, it has fallen (for investigations of Prof. Shokalski, see *Journal de Géographie*, March 15, 1914). It is very shallow in the north, where a depth of 14 feet is reached only at a distance of no less than 10 miles, and that of 12 fathoms (72 feet) at a distance of 130 miles from the mouth of the Volga. In its middle it is intersected by a submarine ridge which continues the main Caucasus chain from the Apsheron peninsula towards the ESE. The greatest depth found in the northern basin is 2526 feet, and in the southern (close by the southern shore) 3096. The Caspian receives the waters of a number of large rivers—the Volga, Ural, Emba, Terek, Kura, and Atrek. Its salinity (mostly from 1 to 1.5 per cent., but far more in the bays) is much less than that of the ocean. The northern parts are covered with ice during winter. Very valuable fisheries are carried on, especially for sturgeon and salmon. Besides many species of its own, it has several species of fish in common with the Black Sea, the Arctic Ocean, and Lake Aral; this suggests that the separation of the Caspian from the Black Sea took place in the early part of the Post-Pliocene period, or perhaps during the Pliocene. By the Volga and its canal system the Caspian is united with the Baltic and White Seas. The southern shore remains Persian. Balfrush, Reshd, and Astrabad are Persian towns on or near the coast. The other chief towns upon its shores are Astrakhan, Derbend, Baku, and Krasnovodsk (q.v.), whence the Transcaspiian railway runs by Askabad, Merv, Bokhara, Samarkand, and Khokand to Andijan. Steamers ply between Krasnovodsk and Baku, which is connected by rail with the Black Sea. The Orenburg-Samarkand railway *via* Tashikand has diverted some of the Transcaspiian traffic.

The Caspian Sea was known to the Greeks and Romans. According to Strabo, it derived its name from the Caspii, a tribe inhabiting its western shores. The name Caspiian was afterwards limited to the western portion of the lake—the eastern being designated the Hyrcanian Sea.

Casque. See HELMET.

Cass, Lewis, American statesman, born at Exeter, New Hampshire, 9th October 1782. He was admitted to the Ohio bar in 1803, but in 1812,

on the outbreak of the second war with Great Britain, entered the army, and rose rapidly to the rank of general. Left in command of Michigan at the close of the war, he was for eighteen years civil governor of the territory which under his skillful administration became a settled and civilised state. From 1831 to 1836 Cass was Secretary of War under General Jackson, and from 1836 to 1842 he was United States Minister at Paris. In 1844 he was much spoken of for the presidency, and in 1848 he received the Democratic nomination, but was defeated at the polls by General Taylor; in 1852 he again lost the nomination. He sat in the senate from 1845 to 1857, when he was appointed Secretary of State, resigning office in 1860 in consequence of President Buchanan's refusal to reinforce Fort Sumter. He now retired from active life, and died at Detroit, 17th June 1866. Scrupulously honest, and generally a prudent and cautious legislator, Cass's position on most questions of his time resolved itself into one of compromise and moderation. His attitude towards slavery was inconsistent, but he appears to have sympathised with the Union in the civil war. For Britain he evinced a bitter hostility. He published a work on the history and languages of the United States Indians (1823), and *France: its King, Court, and Government* (1840). See Lives by W. L. Smith (1856) and A. C. McLaughlin (1891).

Cassagnac, Adolphe Granier de, French journalist, born in the department of Gers in 1806, in 1832 came to Paris, where he was employed on several journals, and where his vehement style of writing soon brought him considerable prominence and a number of duels and law-suits. In 1840 he visited the Antilles, in hopes of political preferment, and there married a Creole lady, Mademoiselle Beauvallon. Until 1848 a zealous Orleanist, he became one of the earliest promoters of the empire, and a bitter assailant of his former patrons, and as a supporter of the government, represented his native department from 1852 to 1870. He founded several papers, of all shades of political and religious thought, and chiefly resembling one another in their early demise; ultimately he became the chief editor of the semi-official *Le Pays*, which he revived after the fall of the empire. He died 31st January 1880. His appearances before the courts of justice were numerous, in his earlier years for duelling, and afterwards in cases of libel and debt. He published two romances and a number of compilations.—His son, **PAUL ADOLPHE MARIE**, born in 1843, joined him on *Le Pays* (1866), assisting with the literary work, and assuming charge of the duelling department of the paper. Having joined a Zouave regiment in 1870 as a volunteer, he was captured at Sedan, and imprisoned for some time in Silesia. He returned to Paris in 1872, renewed his association with *Le Pays*, and violently advocated the imperialist cause. In 1876 he was elected a deputy, and engaged in a course of turbulent insolence and obstruction; he was imprisoned in 1877, and during the autumn openly but vainly urged MacMahon to a *coup d'état*. The death of the Prince Imperial in 1879 disconcerted Bonapartist hopes; and his support of Prince Victor Napoleon introduced dissensions. He founded a Victorist organ and conducted it till his death, 4th November 1904. Of his works a *Life of Napoleon III.* was popular.

Cassander, king of Macedonia, was born about 354 B.C. His father, Antipater, passed him over and bequeathed the regency to Polyperchon, but Cassander allied himself with Ptolemy and Antigonus, and entered on a struggle with his rival. In 318 he gained Athens and most of the Greek cities, next invaded Macedonia,

captured Pydna, and put to death Olympias, mother of Alexander, but spared his widow Roxana and her son Ægus for several years. Meanwhile he married Thessalonica, half-sister to Alexander, in whose honour he founded, about 316 B.C., the town which bears her name. In the following year he caused Thebes, which Alexander had destroyed, to be rebuilt. He next joined Seleucus, Ptolemy, and Lysimachus in their long struggle with Antigonos, which ended with the death of the latter on the battlefield at Ipsus (301). In 306 Cassander had assumed the title of king. He died about 297, leaving his son Philip as his successor.

Cassandra, according to Homeric legend, was the fairest daughter of Priam and Hecuba, and the twin-sister of Helenus. The two children were left one night in the sanctuary of Apollo, and during their sleep their ears were touched and purified by two snakes, so that they could understand the meaning of the language of birds, and thus know the future. Cassandra afterwards attracted the love of Apollo by her beauty, and he taught her the secrets of prophecy; but displeased by her rejection of his suit, laid upon her the curse that her prophecies should never be believed. So she prophesied in vain the treachery of the Grecian horse and the destruction of Troy, and was looked on by the citizens as a mere mad woman, whose words had no value whatever. On the capture of the city she fled to the temple of Athena, but was torn from the altar by Ajax Oileus, and ravished in the temple. In the distribution of the spoil she fell to the share of Agamemnon, and was afterwards murdered by Clytemnestra. The name is now often used generically of one who takes gloomy views of the political or social future, as the late W. R. Greg in his book, *Rocks Ahead, or the Warnings of Cassandra*.

Cassandra, the most western of the three tongues of the Chalcidic peninsula, between the gulfs of Salonica and Cassandra. Its ancient name was *Pallene*. The Gulf of Cassandra (ancient *Toronæus Sinus*) extends 35 miles north-westward, and is 8 to 16 miles broad.

Cassano, a town of Southern Italy, 34 miles N. of Cosenza; pop. 8000.—**CASSANO**, on the Adda, 16 miles ENE. of Milan by rail, was the scene of two sanguinary battles—a defeat in 1705 of the Imperialists under Prince Eugene, by the French under Vendôme; and a defeat in 1799 of the French themselves under Moreau, by the Russians and Austrians under Suwaroff. Pop. 5000.

Cassation, COURT OF. In the law of France, the act of annulling the decision of a court or judicial tribunal is called *cassation*, from the verb *casser*, 'to break or annul' (Lat. *quater*; Eng. *quash*); and the function of cassation, as regards the judgments of all the other courts, is assigned to a special tribunal called the *Cour de Cassation*, which may thus be regarded, in a certain sense, as the last and highest court of appeal. But as everything is excluded beyond the question whether or not the view taken of the law, and of the proper method of administering it by the inferior tribunal, has been the right one, the idea attached to this institution is less that of a court in the ordinary sense, than of a department of government to which the duty of inspecting the administration of justice is assigned. The demand for cassation can be made only by the parties to the suit, or by the *procureur-général* of the Court of Cassation for the public interest. The decisions of other French courts, civil, commercial, and criminal, may be reviewed by the Court of Cassation, with the exception of decisions in the adminis-

trative courts and the judgments of a *juge de paix* (where the amount is less than 100 francs), and of tribunals of commerce (where the amount is less than 1500 francs). These appeals do not involve any stay of execution, and the judgment in cassation is not a judgment on appeal, but merely has the effect of quashing the judgment below. The delay allowed for bringing a civil case before the Court of Cassation is two months for persons domiciled in France; but parties resident out of France have further time. In criminal matters the procedure is greatly more prompt, three full days only being allowed. In all criminal and police cases the Court of Cassation may pronounce judgment immediately after the expiry of these days, and must do so within a month. The court consists of a president, three vice-presidents, and forty-five counsellors or ordinary judges. Its ministerial staff consists of a *procureur-général* and six advocates-general, as well as several inferior officers. The judges of the Court of Cassation are appointed by the President of the Republic, and their appointments are irrevocable. The three sections of the court are the *Chambre des Requêtes*, the *Chambre Civile*, the *Chambre Criminelle*. The whole court, when presided over by the minister of justice, possesses also the right of discipline and censure over all judges for grave offences not specially provided for by the law.

Cassa'va, a West Indian name of the plant also called Manioc (q.v.), and of the starch produced from it, which is otherwise called Brazilian Arrowroot, and is popularly known in Britain as Tapioca (q.v.).

Cassay. See MANIPUR.

Cassel, or KASSEL, chief town of the Prussian province of Hesse-Nassau, and the old capital of the former electorate of Hesse-Cassel, is pleasantly situated on both sides of the navigable Fulda, 120 miles by rail NNE. of Frankfurt-on-Main, and 233 WSW. of Berlin. Pop. (1875) 53,043; (1919) 162,391. The town is one of the most attractive provincial capitals in Germany. Its oldest part consists of a few very narrow, crooked streets, close to the river; the more modern parts are situated on gentle hills. The 'upper new town' was founded by French refugees in 1688. Cassel is partially walled. In the *Friedrichs-Platz*, a square of great size, stand the palace of the old Electors, a comparatively mean structure, the military school, and the large *Museum Fridericianum*, erected in 1769-79, which contains a library of 200,000 volumes and some valuable MSS., besides collections of plaster-casts, antiquities, coins, &c. The large new law-courts were erected in 1880 on the site of the Kattenburg, a costly and ambitious palace projected in 1820, which, however, remained unfinished from 1821 till 1869, when its materials were used in the construction of the new picture-gallery. The latter, opened in 1877, contains about 1400 paintings, including some excellent specimens of Dutch and other old masters. Cassel has an observatory, and is the seat of a number of learned and scientific associations. It carries on manufactures of locomotives and steam-engines, carriages, philosophical and mathematical instruments, cotton and linen fabrics, plate, and sugar. Cassel is the birthplace of the chemists Bunsen and Kolbe; the brothers Grimm here wrote their famous fairy-tales between 1806 and 1814; and Spohr conducted the orchestra of the theatre from 1822 till 1859. Cassel appears to have existed as early as the 10th century under the name of *Chassala*. From 1807 to 1813 it was the capital of the kingdom of Westphalia. The gardens of Wilhelmshöhe (1787-96)—which was assigned to Napoleon III. as a residence after

his fall at Sedan, in September 1870—with their splendid fountains and cascades, and the colossal statue of Hercules, within the hollow of whose club eight persons can stand at one time, are three miles from Cassel.

Cassell, JOHN, founder of the publishing firm of Cassell & Co., the son of a Manchester inn-keeper, was born 23d January 1817. He had but a poor education, but while an apprentice joiner, by careful self-culture, fitted himself for the post of a temperance advocate. He went to London in 1836, and was settled as a tea and coffee merchant in 1847, but soon after turned author and publisher, issuing his *Working Man's Friend* (1850), *Illustrated Exhibitor* (1851), *Popular Educator* (1852), the most popular of all his works, which in a revised form is still on sale; and *Family Paper* (1853). In 1859 he entered into partnership with Messrs Petter & Galpin, and before his death, on 2d April 1865, he had the satisfaction of witnessing, and sharing in, the prosperity of one of the largest book-factories of modern times.

Cassels, WALTER RICHARD (1826-1907), author, followed commercial pursuits in India, and in 1863 was elected a member of the Legislative Council of Bombay. He retired in 1865 and devoted himself to literature. In addition to his *Supernatural Religion*, which appeared in 1874, and of which a revised edition was published in 1902, he was the author of *Cotton and its Cultivation*.

Cassia, a name given by the ancients to a kind of aromatic bark identified with the Cassia Bark or *Cassia lignea* (sometimes also China Cinnamon) of our shops, and referred to *Cinnamomum Cassia*. It is essentially a cheaper and coarser form of Cinnamon (q.v.), for which it forms an excellent substitute—its essential oil being chemically similar, although more or less inferior in fragrance and flavour.

CASSIA BUDS are the immature fruit of the same tree, and have been imported from China since the middle ages: in Southern India a very inferior variety is also produced. The leaves of other species of Cinnamomum are variously used in Mysore; while in Peru and Ecuador the large woody calyx of a lauraceous tree (*Nectandra sp.*) serves the same purpose. The 'white cinnamon' of the West Indies is Canella Bark (q.v.).

CASSIA is also the botanical name of a large genus of Leguminosæ (sub-order Cesalpiniæ), trees, shrubs, and even herbs. Some are cultivated on account of their graceful foliage and handsome yellow flowers; their chief importance is, however, medical, the leaves of several species furnishing Senna (q.v.), while the drug known as Cassia Fistula or Purging Cassia is derived from the pod of *Cassia Fistula*, of which the bark is used in tanning, and also yields a yellow dye. The name, however, in ancient writers clearly applies to a tubular bark, no doubt some variety of the spice Cassia above mentioned (q.v.). For *Poet's Cassia*, see CASIA.

Cassianus, JOANNES EREMITA, or JOANNES MASSILIENSIS, an early monk and theologian, born most probably about 360. He spent some years among the ascetics of the Egyptian deserts, was ordained by Chrysostom at Constantinople in 403, and afterwards instituted monastic life in Provence, in the south of France. Shortly before 415 he founded at Massilia two monasteries according to the rules laid down in his *De Institutis Cœnobiorum*. One of these monasteries was for nuns; the other was the famous Abbey of St Victor, which under its founder is said to have possessed not less than 5000 inmates, and which served as a model to a multitude of monastic institutions in Gaul and Spain. He died about 448, and was afterwards canonised, his festival falling on 25th July. In his writings Cassianus appears as the opponent of the

extreme dogmas of St Augustine respecting grace and free-will. His *Collationes Patrum Sceticorum* is a work in 24 chapters, each of which gives a 'spiritual colloquy between monks in the desert of Sketis,' regarding the monastic life and the vexed questions of theology. Cassianus was one of the first of the 'semi-Pelagians' rejecting the extreme view taught by St Augustine of man's worthlessness and natural incapacity for good; his views being substantially identical with what was long afterwards known as Arminianism.

See the edition by Gazeus (1616), and the Life and translation by Gibson (1895).

Cassican (*Cassicus*), a genus of American birds allied to starlings, and yet more closely to the Hang-nests or Icteridæ. They exhibit marvellous skill in knitting together the shreds, &c., which form their hanging nests. See BALTIMORE BIRD, HANG-NESTS.

Cassidaria, a genus of molluscs—class Gastropoda (q.v.), order Prosobranchiata, family Cassidæ. The shell is roughly oval, with a wide mouth, a fairly long siphon canal, and without a closing lid. There are six modern Mediterranean species, and five times as many extinct in the Upper Chalk and Tertiary strata. See HELMET-SHELL.

Cassini, the name of a family distinguished for their services in astronomy and geography.

GIOVANNI DOMENICO CASSINI, born at Perinaldo, near Nice, 8th June 1625, studied at the College of Jesuits, Genoa, and at Bologna, where in 1650 he was appointed to the astronomical chair. His first work related to the comet of 1652. He subsequently devoted himself to the determination of astronomical refraction and of the sun's parallax, &c. In 1664-65 he determined the period of Jupiter's rotation. Subsequently he determined the periods of the planets Mars and Venus, and made a near approximation to the parallax of the sun. He discovered four of the satellites of Saturn, as well as the dual character of that planet's ring, and was the first who carefully observed the zodiacal light; he also demonstrated that the axis of the moon was not (as had been believed) at a right angle to the ecliptic, and explained the cause of the phenomenon known under the name of lunar libration. He had an important share in the Meridian (q.v.) measurement begun in 1669. After a long life devoted to painful observations that ultimately deprived him of sight, he died September 14, 1712, at Paris, whither he had gone in 1669, at the invitation of Colbert, to take charge of the observatory erected by that minister.

JACQUES CASSINI, his son, born at Paris, February 18, 1677, was elected a member of the Academy of Sciences in 1694, travelled in Italy, Holland, and England, where he formed the acquaintance of Newton, Halley, Flamsteed, and others, and was elected a member of the Royal Society. He succeeded his father as director of the observatory at Paris, and died April 16, 1756. He wrote several treatises on electricity, the barometer, and astronomical subjects, &c.—His son, CÆSAR CASSINI (1714-84), was also engaged in scientific pursuits.

Caesar's son, JEAN DOMINIQUE, COMTE DE CASSINI, born at Paris, June 30, 1748, succeeded to the charge of the observatory, and completed in 1793 the great topographical map of France begun by his father. He subsequently became a member of the Institute. He died October 18, 1845.

Cassino. See MONTE CASSINO.

Cassiodorus, MAGNUS AURELIUS, a Latin statesman and historian to whom we owe most of our information respecting the Gothic kingdom of Italy, was born at Scyllaceum (Squillace) in Calabria

in 468 A.D. He belonged to a noble family, and became secretary to the great Ostrogothic king, Theodoric. He held the offices of quæstor and prætorian prefect, was sole consul in 514 A.D., and after the death of Theodoric in 526 A.D. acted as chief minister to Queen Amalasontha. He was an able and broad-minded statesman, to whom the success of Theodoric's policy must be in part ascribed. He seems to have retired from public life not later than 540 A.D., and to have spent the last thirty years of his long life in Calabria, where he died about 568 A.D. Cassiodorus wrote a history of the Goths (*De Rebus Geticis*), which we only possess in the form of the epitome made of it by Jornandes. His other work, *Variarum Epistolarum Libri XII.*, consists of a collection of the letters which he wrote as secretary to the Gothic sovereigns. They have no literary merit, for the style is bombastic and exceedingly diffuse, but their historical value is of the highest. They form, says Dean Milman, 'a rare collection of original official documents, which admit us, as it were, to the council-board of the cabinet at one of the most interesting of all periods of history.' They shed a flood of light on the policy pursued by Theodoric and his successors, the condition of the people, the affairs of the church, and the fiscal and administrative system of the Gothic kingdom of Italy. An edition of the letters was published in 1679 (2 vols. folio, Rouen). See Hodgkin's *Letters of Cassiodorus; a condensed translation* (1886).

Cassiope'ia, the *Lady in her Chair*, a constellation in the northern hemisphere, near Cepheus, and not far from the north pole, named after the mother of Andromeda. It is marked by five stars of the third magnitude, forming a figure like a W. In the year 1572 there all at once appeared in Cassiopeia a new star, which when first noticed by Tycho Brahé exceeded in brightness all the fixed stars, and nearly equalled Venus. The star gradually diminished in lustre, and disappeared in March 1574.

Cassiquia'ré, or CASSIQUIARI, a river of Venezuela, South America, forming the south bifurcation of the Orinoco, which it leaves in 3° 10' N. lat., 66° 20' W. long., and after a rapid south-west course of about 130 miles, joins the Rio Negro in 2° 5' N. lat., 67° 40' W. long. near San Carlos. By means of this singular river, water-communication is established, through the Amazon, Orinoco, and their affluents, between the interior of Brazil and a large tract in Venezuela.

Cassis, a genus closely allied to Cassidaria, with a shorter siphon canal and with a closing lid. It is a much larger genus, with 42 living species, but with fewer (25) known fossils in the Tertiary epoch. Some large species are used for cameos. See HELMET-SHELL.

Cassiter'idēs, the 'Tin Islands,' first merely mentioned by Herodotus, where the merchant-sailors of Carthage bartered their wares for tin. The Greek *kassitēros*, 'tin,' is the Sanskrit *kastira*, and it has been supposed that the Phœnicians brought the name with the metal from the islands off the coast of India. The islands appear on Ptolemy's map as off north-western Spain, but they were afterwards identified with the Scilly Islands, or with Cornwall; with the little islands about Vigo Bay, off the Spanish coast (Elton); and, by Sir John Rhys, Reinach, and others, with the British Islands themselves—for which, perhaps, Cassiterides is a (modified) Celtic name.

Cassiterite, oxide of tin or common tin ore, occurs massive or in the form of crystals, which are often quadrangular prisms terminated by four-sided pyramids. It appears, however, in many other complex crystalline forms. These are gener-

ally blackish brown or black, but greenish shades are also met with—the dark varieties being opaque, while those that are lighter in colour are somewhat translucent. Cassiterite contains about 78 per cent. of tin, and is the ore from which most of the tin of commerce is obtained. It has been worked from a very remote period in Cornwall, and is met with in many other countries, as in Brittany, Bohemia, Saxony, Spain, Finland, Sweden, Greenland, United States, Mexico, Chili, Sumatra, Malay Peninsula, Australia, &c. *Stream tin* is the name given to rounded fragments of cassiterite found in alluvial deposits in Cornwall, Malay Peninsula, &c.

Cassius, the name of a famous Roman gens, which, originally of patrician rank, afterwards became plebeian. Its most famous members were (1) SPURIUS CASSIUS VISCCELLINUS, who was thrice consul, first in 502 B.C., and the promoter of the first agrarian law at Rome (486). By this he made himself so hateful to his own order that they found means to condemn him to death on a trumped-up charge of aiming at regal power.—(2) CAIUS CASSIUS LONGINUS, the most active of the conspirators against Cæsar. He distinguished himself by his conduct as quæstor to Crassus in the Parthian war, and still more greatly by his energy and resource in the disasters that followed his general's death. He was tribune of the people at the breaking out of the civil war, and at once attached himself to Pompey. After the disaster of Pharsalia he was taken prisoner in the Hellespont by Cæsar, and pardoned with that conqueror's usual magnanimity. In 44 B.C., through the influence of Cæsar, he was made prætor, and was promised the governorship of Syria in the following year. But his mean and jealous spirit could not endure the burden of gratitude imposed upon him by the generosity of the dictator, and he resolved to be released by the murder of his benefactor. He first attached to himself the mutinous spirits among the subjugated aristocracy, and next won over M. Brutus. The pseudo-patriotic conspiracy was soon matured, and on the 15th of March 44 B.C. Cæsar fell by the daggers of his assassins. But popular feeling blazed out against the murderers, and Mark Antony had the wit to seize his opportunity. Cassius fled to the east, made himself master of Syria, then united his forces with those of Brutus, and after cruelly plundering Asia Minor, crossed the Hellespont into Thrace. At Philippi the division commanded by Cassius was totally routed, and Cassius, supposing that all was lost, compelled his freedman to kill him.—For another Cassius Longinus, see LONGINUS.

Cassius. See DION CASSIUS, and PURPLE.

Cassivellamus, a British chief who fought against Cæsar during his second invasion of the island, 54 B.C. The chief of the Cassi, he had seized the sovereignty of the 'Trinobantes,' and had a great reputation as a warrior, but his capital was taken by the Romans, and he himself compelled to flee. He afterwards sued for peace, which he obtained on condition of paying tribute and giving hostages.

Cassock, a long loose robe or outer coat, formerly in common wear, but now worn only by the clergy and choristers. As worn by the clergy of the Church of England it is a long coat with a single upright collar. Black is the common colour for all orders of the clergy. In the Roman Catholic Church cassocks vary in colour according to the dignity of the wearer—priests wearing black, bishops purple, cardinals scarlet, the pope white.

Cassowary (*Casuarinus*), a genus of running birds (*Ratidæ*), nearly allied to the Emu (*Dromæus*), with which they agree in having the body-feathers provided with an after-shaft as long as the shaft, in having the 'fingers' of the much-

reduced wing represented by one claw-bearing digit, and in having three toes. The top of the head bears a horny, brightly coloured helmet; the neck is usually ornamented with bright wattles; the wing has its feathers reduced to five or six; the inner toe has a long sharp claw. Cassowaries live in forests and scrub, and feed on soft parts of plants; they have great powers of running and leaping, and also of swimming. They kick forwards when attacked, and strike with the rigid barbs of the degenerate wing. Their cry is 'a loud, harsh, quickly repeated guttural sound audible at a great distance.' Three to six greenish eggs are laid



Cassowary (*Casuaris galeatus*).

among fallen leaves and rubbish, and are incubated (for about seven weeks) by the male, who also tends the young birds. Nineteen species are known, and their geographical distribution is very interesting. One occurs on the mainland of Australia, seven in New Guinea, and the remaining eleven on as many separate islands which apparently represent parts of the original New Guinea. This probably illustrates isolation as a factor in evolution. The flesh of the cassowary is dark in colour, tough and juiceless. The skin is used by the natives in making mats and ornaments. See EMU, OSTRICH; and a book by Hon. W. Rothschild (1900).

Cast, an object formed by pouring molten or liquid material into a mould, in which the substance sets or hardens, assuming the form and outlines of the mould. The process has a very wide application in the arts, its principal utilisation being in connection with the metallic industries. Casting on the large scale, specially in connection with iron and brass work, including statuary, is known as Founding (q.v.), though the products are still termed castings. So also the process of casting types is called typefoundry. But when small objects in metal are dealt with, as in the jewellery trade, the process is known simply as casting. Plaster of Paris is an important medium for obtaining the first permanent casts of artistic sculptures and mouldings from the clay models of artists, as well as for preparing copies of sculptured works. In the same way the moulded ornaments used by plasterers are also prepared in plaster of Paris (see GYPSUM). Casts from plaster moulds are also made in wax for models of fruits, human masks, and other subjects. Casting is further employed in glass manufacture, in which moulded and cast ornaments and forms are precisely analogous to castings in other media. When the material employed in obtaining an impression from a mould is

of doughy consistence requiring to be kneaded in the process, it is known as moulding, and that forms an important feature in the pottery manufacture.

Castagno, ANDREA DEL (1390-1457), a Florentine painter, born in the Mugello. A baseless tradition that he murdered his rival, Domenico Veneziano, long prevailed.

Castaldi, PAMFILO, a scholar, born 1398 at Feltre, Lombardy, by some accounted the inventor of printing with movable types. See FUMAGALLI'S *La Questione di P. Castaldi* (1891).

Castalia, a fountain on the slope of Parnassus, a little above Delphi, in Phocis, sacred to Apollo and the Muses. All who visited the Delphian temple were wont to bathe their hair *rore puro Castaliæ* ('in the pure dew of Castalia'), but those who needed to be purified from murder bathed their whole body. Its waters, moreover, gave poetic inspiration to those who drank. The name was due to Castalia, daughter of Achelous, who threw herself into the fountain to escape the pursuit of Apollo.

Castamouni. See KASTAMUNI.

Castanea. See CHESTNUT.

Castanets, a musical instrument of percussion in the form of two hollow shells of ivory or hard wood, which are bound together by a band fastened on the thumb, and struck by the fingers to produce a trilling sound in keeping with the rhythm of the music. The *krotalon* used in the worship of Cybele and Dionysus was somewhat similar. The castanets were introduced into Spain by the Moors, and are much used as an accompaniment to dances and guitars.

Castaños, DON FRANCISCO XAVER DE, Duke of Bailen, a celebrated Spanish general, was born at Madrid in 1756, and studied military tactics in Germany. On the invasion of the country by Napoleon, he received the command of a division of the Spanish army, and in July 1808 compelled 18,000 French, under General Dupont de l'Étang, to surrender at Bailen, but was in his turn defeated by Lannes in November of the same year at Tudela. Under Wellington he served as general of the 4th Spanish *corps d'armée*, and took part in the battles of Albuera, Salamanca, and Vittoria. In 1815 he was placed at the head of the Spanish army for the invasion of France, which was rendered unnecessary by the victory at Waterloo. In 1825 he was called to the state council, where he became a decided opponent of the Carlist party. He died, aged ninety-six, on 24th September 1852.

Caste, a term applied chiefly to distinct classes or sections of society in India, and, in a modified sense, to social distinctions of an exclusive nature among other nations. Such distinctions existed in ancient states, as in Persia and Peru (not Egypt), and still exist in Polynesia and elsewhere; but it is with India that we more especially associate the idea of caste. There the system has received its fullest development, and the mass of the population is divided into innumerable classes, the Hindu name for which is *jāti*, a race or class. This term the Portuguese rendered by their equivalent *casta*, whence comes the English *caste*.

When the Aryan race penetrated into India, the conquerors distinguished themselves from the non-Aryan population by the epithet *twice-born*—i.e. those who have passed through a second or religious birth, which was symbolised by the sacrament of investiture with the sacred cord at the age of puberty; the aborigines they named the *once-born*. The twice-born themselves were divided into three classes in the course of time, a sacerdotal class called Brahmins, a ruling military

class, Kshatriyas, and an agricultural class, Vaisyas. The once-born were called Sûdras. The unequal social rank of these four classes was assigned to an inequality of origin, and this was mythically expressed in a late hymn of the Rig Veda, in which it is said that the Brahman was the mouth of the primitive Man (*purusha*), the Warrior his arms, the Vaisya his thighs, and that the Sûdra sprang from his feet. In the code of Manu the duties and mutual relations of these four castes are systematised and defined.

The *Brahman* is devoted to the service of religion; he alone mediates between God and man, and has the right of performing sacrifice and teaching the sacred Veda; he is himself an actual divinity. His life is portioned out into four periods: (1) As a student he lives with his spiritual preceptor, and acquires a knowledge of the Veda; (2) he becomes a householder by entering the married state, and performs the appointed daily sacrifices; (3) he lives in the woods as a hermit; (4) he cuts himself off from the world, and by profound meditation attains to absorption into Brahma. The last two are no longer obligatory.

The *Kshatriya's* sphere of duty lies in the state. He is to be the mainstay and support of the higher Brahman. The latter draws up and interprets the laws, the former executes them. The *Vaisya's* occupation is the cultivation of the soil and the practice of trade. The *Sûdra* is to be the servant of all three, especially of the Brahman; his hope is that after death he may be born into a higher caste. (Yet the Maharajah of Travancore is a Sûdra; so was Chandragupta.)

Besides these four castes, usually called *varnas*, or colours, various mixed castes are enumerated in Manu as resulting from the intermarriage of the pure castes. The minor castes are mostly subdivisions of the Sûdra. The Chandalas are Hinduised aborigines: the out-caste Pariahs (q.v.) of Southern India are separately dealt with. The Brahmans of Southern India are many of them not of Aryan blood.

The system of caste which at present exists throughout the greater part of India is very different from that described in the code of Manu. With the exception of the Brahmans, the pure castes have disappeared, unless the claim of the Rājputs to be the lineal descendants of the Kshatriyas be admitted, and out of the intermixture of the others have sprung innumerable classes. At the census of 1911, the 'main castes' enumerated in India numbered 180, many of these again falling into numerous subdivisions. Of 50,000,000 representatives of agricultural castes, there are some forty or fifty groups and sub-groups. Of 217,337,943 Hindus or persons professing the Brahmanic faith, 14,598,708 were set down as Brahmans, broken up into a vast number of minor classes—Sherring enumerated 1886 'tribes.' There were 9,430,095 Rājputs, split into 500 'tribes.' The Maratha caste had over 5,000,000 members; the Jat caste, nearly 7,000,000. So engrained in the whole community is this tendency to class distinctions, that Mussulmans, Jews, Parsees, and Christians fall, in some degree, into it; and even excommunicated or out-cast Pariahs form castes among themselves. Most of the existing castes partake of the nature of associations for mutual support or familiar intercourse, and are dependent upon a man's trade, occupation, or profession. Many have had their origin in guilds, in schism from other castes, in the possession of a particular sort of property (as, for instance, landlords are spoken of as the caste of *zemindars*), and similar accidental circumstances. Their names are often due to the district in which the caste took its rise, to their founder, to their

peculiar creed, or any random circumstance. In the Bengal presidency there are many hundreds of such castes, almost every district containing some unknown in those adjacent. In the small state of Travancore, with a population of about two and a half millions, there are said to be 420 castes. There the aboriginal Sûdra Nairs form the ruling or Kshatriya caste, and the half-Arab Mohammedan Moplah takes the place of the Vaisya. Among the lowest classes, it has degenerated into a fastidious tenacity of the rights and privileges of station. For example, the man who sweeps your room will not take an empty cup from your hand; your groom will not mow a little grass; a coolie will carry any load, however offensive, upon his head, but even in a matter of life and death would refuse to carry a man, for that is the business of another caste. When an English servant pleads that such a thing 'is not his place,' his excuse is analogous to that of the Hindu servant when he pleads his caste. When an Englishman of birth or of a profession held to confer gentility refuses to associate with a tradesman or mechanic, it would present itself to the mind of the Hindu as a regulation of caste. Caste does not absolutely tie a man down to follow his father's business, except, perhaps, in the case of the more sacred functions of the Brahmans. For the rest, Brahmans serve as soldiers, and men of all castes have risen to power. Nor is loss of caste anything so terrible as has been represented; in most cases it may be recovered by a frugal repast given to the members of the caste; or the outcast joins another caste. According to many good recent authorities, except Brahmans and Kshatriyas, the four castes are little heard of, and castes are now practically trades, professions, guilds, sub-tribes, &c., which live by themselves and intermarry. Those who do not belong to the four higher castes are now officially and euphemistically called Panchamas, 'of the fifth caste.' To the panchamas belong most servants to Europeans (high-caste servants would not cook for Christians), as also most Christian converts. Perhaps 50,000,000 Indians, a large proportion of them Hindus by religion, are looked on by the castes above them as 'untouchable'; touching them involves ceremonial defilement. Many Hindus have become Mohammedans or Christians mainly to escape the disabilities of caste. Yet even Mohammedans in India recognise to some extent the distinctions of caste. 'Untouchables' become less untouchable when they become Mohammedans or Christians.

It seems certain that many of the rules and restrictions of caste, with the self-respect to which they lead, have conduced to the purity of the family, as well as to cleanliness and health. It is an aid to the weaker members of a caste to know that if they disgrace themselves their fellow-members everywhere will shun them instead of helping them.

Important recent works on caste are Sridhar Kelkar's *History of Caste in India* (1905); Thurston and Rangachari, *Castes and Tribes in Southern India* (7 vols., Madras, 1905-10). The petty regulations of caste, as laid down in the code of Manu, may be seen in the *Translations of the Code of Manu*, by Jones, Burnell, or Bühler; Robertson's *Disquisition on India*; Richard's *India*; Elphinstone's *History of India*; Dubois's *India*; Colebrooke's *Asiatic Transactions*, vol. v.; and in various articles in the *Calcutta Review*. See above all the first volume of Dr John Muir's *Sanskrit Texts* (5 vols.); Steele's *Law and Custom of Hindu Caste* (1868); Kaye and Watson, *The People of India* (6 vols. 1868-72); Sherring's *Hindu Tribes and Castes in Benares* (3 vols. 1872-81); and the Report on 'Caste, Tribe, and Race' in the 1911 *Census of India*, vol. i. (1913).

Castelar, EMILIO, a prominent Spanish orator, statesman, and writer, was born at Cadiz, September 8, 1832. He studied at Madrid, and in

1856 became professor of History and Philosophy in the university there. He began early to write on letters and politics in the newspapers and magazines, and in 1864 started *La Democrazia*, in the pages of which he inveighed fiercely against the government. After the abortive rising of 1866 he was condemned to death, but contrived to escape to Paris, returning when the revolution of 1868 began. All his ardour and eloquence could not hinder the crowning of King Amadeus, though it helped to bring about his downfall in 1873. In the September of that year the Cortes made Castelar dictator, but the orator proved somewhat ineffectual in action, and found himself unable to crush either the 'red demagoguery of Socialism on the one hand, or the white demagoguery of Carlism' on the other. In the beginning of 1874 a hostile vote in the Cortes obliged him to resign, and soon after the *pronunciamiento* in favour of Alfonso XII. drove him across the frontier. He returned to Spain in 1876, and was returned to the Cortes, where, till his retirement in 1893, he often spoke with all his old eloquence. He died 25th May 1899. His chief writings are *La Civilizzazione* (2d ed. 1865), *Questiones políticas y sociales* (3 vols. 1870), *Historia del Movimiento republicano en Europa* (2 vols. 1874), *La Question de Oriente* (1876). See Lives by Sanchez de Real (1874), Sandoval (1886), Hannay (1896), and Araco (1900).

Castelbuono, a town of Sicily, 8 miles SE. of Cefalù, with mineral springs, a former Benedictine monastery, and a trade in manna; pop. 12,000.

Castelfranco, a town of Central Italy, 8 miles SE. of Modena; pop. 4000.—Also a town of Italy, 15 miles W. of Treviso by rail, the scene of an Austrian defeat by the French, under Saint-Cyr, 24th November 1805. The principal church possesses a celebrated altar-piece by Giorgione, who was born here. Pop. 7000.

Castel Gandolfo, a village 12 miles SE. of Rome, near the west shore of Lake Albano. Here Urban VIII. built a summer residence for the popes. Pop. 3000.

Castellamare, a fortified city and seaport of South Italy, 17½ miles SE. of Naples by rail, built along a sheltered beach on the south-east side of the Gulf of Naples, over which it commands a magnificent view. It is on or near the site of the ancient *Stabiae*, which was desolated by Sulla during the Social War, and where the elder Pliny afterwards lost his life when the city was overwhelmed with lava from Vesuvius (79 A.D.). The town was sacked in the 15th century by Pope Pius II., and again in 1654 by the Duc de Guise. The Castello that gave it name was built by Frederick II. in the 13th century. Castellamare has a cathedral, an arsenal, a dockyard; exports potatoes; and manufactures macaroni, cotton, sail-cloth, &c. Pop. 30,000.

Castellamare, in Sicily, at the head of a gulf of the same name, 41 miles WSW. of Palermo by rail, has a population of 17,000, and exports of cotton, wine, fruit, and manna.

Castellan, or CHÂTELAIN, the keeper of a castle in the middle ages. His office and rank varied in various countries. In France and Flanders, the title castellan belonged to the holders of certain demesnes, and was next in order of rank to that of a bailiff.

Castella'na, a town of South Italy, 26 miles SE. of Bari; pop. 11,000.

Castellane'ta, a cathedral city of South Italy, 24 miles NW. of Taranto by rail; pop. 10,000.

Castellio, SEBASTIANUS, a theologian, born in Savoy in 1515, studied at Lyons, and about 1540, on Calvin's recommendation, was appointed rector of a school at Geneva. His views, however, as to

the Song of Solomon (a mere erotic poem to him) and Christ's descent into hell embroiled him with the reformer; and in 1544 he was forced to migrate to Basel, where in 1553 he became Greek professor, and where he died 23d December 1563. Besides various treatises, he published in 1551–53 translations of the Bible into Latin and French, the former dedicated to Edward VI. of England. See CALVIN.

Castello Branco, a town of Portugal, 115 miles NE. of Lisbon, on a height overlooking the Ponsul, with old walls, a ruined castle, and Roman remains; pop. 10,000.

Castellón de la Plana, a town of Spain, in a fruitful plain, 5 miles from the Mediterranean, and 43 NNE. of Valencia by rail. Its churches contain several paintings by Ribalta, who was born here in 1551. There are manufactures of linen, woollen, sail-cloth, brandy, &c. Pop. 31,500. The town is capital of a like-named province (area, 2500 sq. m.; pop. 300,000), and near it is a district rich in oil-shale, now largely worked.

Castelnau, ÉDOUARD DE CURIÈRES DE, French general, born at Rouergue in 1851, served in the Franco-Prussian war, and later became closely associated with Joffre. In the Great War he held various commands on the western front, and was 'major-general of all the armies' under Joffre. He is specially associated with the defence of Verdun.

Castelnaudary, a town in the French department of Aude, situated on a declivity, skirted at the base by the Canal du Midi, 34 miles SE. of Toulouse by rail. It manufactures woollens, silks, and earthenware. Pop. 6000. The *Sostomagus* of the Romans, and *Castrum Novum Arianorum* (hence the modern name) of the Visigoths, Castelnaudary suffered dreadfully in the crusade against the Albigenses, and in 1355 it was captured by the Black Prince. Under its walls, in 1632, the royalists defeated the Duke of Orleans.

Casteltermini, a town of Sicily, 20 miles N. of Girgenti by rail, with extensive mines of rock-salt and sulphur; pop. 15,000.

Castelvetro, a town of Sicily, 46 miles SE. of Trapani by rail, with considerable trade in wine and oil, and manufactures of silk, cotton, and woollen goods; pop. 25,000.

Castelvetro, LODOVICO (1505–71), a humanist, born at Modena, perhaps 'the most illuminating critic of the art of poetry between Longinus and Dryden.' See his *Opere Varie Critiche* (1727) and Charlton's *Castelvetro's Theory of Poetry* (1913).

Casti, GIAMBATTISTA, poet, born at Prato, in Tuscany, probably in 1721, took orders, but in 1764 was introduced to the court of Vienna, where he gained the favour of Joseph II., and was made poet-laureate. On the emperor's death (1790) he returned to Florence, and in 1798 removed to Paris, where he died, 6th February 1803. His best-known works are the 48 *Novelle Galanti* (Paris, 1793) and *Gli Animali Parlanti*, a political satire of charming spirit and grace (free verse translation in W. S. Rose's *Court and Parliament of Beasts*, 1819).

Castiglio'ne, a town of Sicily, on the north slope of Mount Etna, 35 miles SW. of Messina, famed for its hazel-nuts; pop. 12,000.

Castiglione, BALDASSARE, COUNT (1478–1529), became a favourite of the Duke of Urbino, and in 1505 was envoy to Henry VII. of England, who made him a knight. Sent on an embassy to Spain by Clement VII., he died at Toledo, 2d February 1529. His *Il Cortegiano* (trans. 1561), a manual for courtiers, is remarkable for its elegant style. So are his Italian and Latin poems; and his letters are very noteworthy contributions to the political and literary history of his time. Mrs Ady (Julia

Cartwright) published a Life of him, with his letters, in 1908.

Castiglione, CARLO OTTAVIO, COUNT (1784-1849), born at Milan, in his *magnum opus* (1826) sought to ascertain the history of the towns in Barbary whose names are found on Arabic coins; and he edited some fragments of the Mæso-Gothic translation of the Bible by Ulfilas (q.v.).

Castiglione, THE COUNTESS (1840-1900), a beautiful and brilliant Florentine lady of doubtful paternity, daughter of the Countess Oldoini, who at fourteen married the Count Castiglione, but afterwards separated from him. She was afterwards sent to Paris by Cavour as his 'decoy duck,' to secure by whatever means the sympathy and support of Louis Napoleon for the Italian cause. She claimed to have made him take up the cause, and was very conspicuous at his court. After the definitive establishment of the French republic in 1876, she disappeared into obscurity, poverty, and squalor. See Loliée, *Le Roman d'une Favorite* (1912).

Castiglione delle Stiviere, 22 miles NW. of Mantua, is noted for the victory by the French over the Austrians in 1796, which gave the title of duke to Augereau; pop. 6000.

Castile (Span. *Castilla*), the central district of the Spanish peninsula, divided by the Castilian Sierras (8730 feet) into Old and New Castile—*Castilla la Vieja* and *Castilla la Nueva*. The former district—so called because it was first recovered from the Arabs—extends north to the Bay of Biscay, is walled in on all other sides by mountain-ranges, and rises to the height of 2500 to 3000 feet in the form of an elevated plateau, mostly trackless, treeless, exposed to frequent droughts, and generally dreary, parched, and barren, in spite of a few rich tracts. Old Castile is now divided into the eight provinces of Palencia, Valladolid, Avila, Segovia, Soria, Burgos, Logroño, and Santander. The plateau of New Castile, to the south, is also inclosed by mountains, and though lying 1800 feet lower than Old Castile, presents many similar characteristics of soil and scenery, and everywhere the same dreary aspect. It embraces the provinces of Madrid, Toledo, Guadalajara, Ciudad Real, and Cuenca. Old Castile has an area of 25,280 sq. m., and a pop. of 2,500,000; New Castile, 27,935 sq. m., with a pop. of 2,300,000. See the figures for the provinces at SPAIN.

The Castilians are a grave, silent, somewhat stern people, preserving with the haughtiness and pure Spanish of their forefathers also their ignorance and bigotry, but are nevertheless a loyal and manly race. In New Castile a mixture of Mozarabic and Spanish blood has produced a race of men, lean but muscular, and women, slender, graceful, and vivacious; they are the most intelligent people of Central Spain, possess a shrewd mother-wit, and have even more than the general haughtiness of the Spanish character. The language of Castile prevails throughout the educated classes, as in the literature of Spain, and its rulers have extended their sway over the whole nation.

Castile, so named from the great number of its frontier castles, was from the 8th century under the suzerainty of the kings of Asturias and Leon, but was governed by its own counts, who in the 10th century became practically independent. In 1026 Sancho the Great of Navarre annexed the greater part of Castile, which he left to his second son, Ferdinand I. (1035-67), who annexed Leon, Asturias, Galicia, and the district on the right of the Ebro. This union was not permanent, his territories being divided at his death among his three sons; but in 1072 the kingdom was reunited under Alfonso VI. The two kingdoms, however, were finally reunited in the person of

Ferdinand III. (1230-52), who captured Cordova and Seville, and extended the frontier of Castile to the southern coast. Among the successors of Ferdinand III., the most distinguished were Alfonso X. and Pedro the Cruel (q.v.). For two centuries the history of Castile is largely a record of minorities and civil wars, until, by the marriage of Isabella, sister and successor of Henry IV., with Ferdinand, king of Aragon (1469), the two crowns of Castile and Aragon became united (1479), and the kingdom of Spain was founded. See SPAIN.

Castillejo, CRISTÓVAL DE, the last of the old Spanish court poets, born at Ciudad Rodrigo about 1490, became secretary to the Infante, afterwards Ferdinand I., whom he followed to Germany. He died in Vienna, 12th June 1556.

Castillo. See DIAZ DEL CASTILLO.

Castillon, a town of 3000 inhabitants in the French department of Gironde, on the right bank of the Dordogne, 33 miles E. of Bordeaux by rail. Beneath its walls, on 17th July 1453, the English met with a signal defeat, their leader, Earl Talbot of Shrewsbury, and his son, being slain. Part of the battle is described in the fourth act of Shakespeare's *King Henry VI., Part I.*

Casting. See FOUNDING.

Casting-vote, the vote by which the chairman or president of a meeting is generally empowered to cast the balance on the one side or the other, where the other votes are equally divided. In the House of Commons the Speaker does not vote at all unless this state of things occurs. As his position in this respect is felt to be a delicate one for a person whose duty it is to withdraw himself from the contentions of party, it is usual for the Speaker to vote in such a way as to give the House an opportunity of reconsidering its decision by further discussion; but if the merits of a bill cannot be avoided, the Speaker is entitled to vote according to his conscience. The same rule prevails in select committees, and for the chairman of Committee of the whole House or of Ways and Means. Following a similar rule, the chairman at corporation and ordinary public meetings usually gives his casting-vote in a way that will lead to a reconsideration of the subject.

Cast-iron. See IRON.

Castle. Castles or fortified places for defence are common to all nations, and seem, like houses, to have generally passed through various stages of development. The earliest fortress consisted of a naturally strong site, defended either by water, as in the case of a small island, or by difficulty of access, as in the case of a precipitous and isolated rock. For these primitive strengths artificial means of defence were afterwards substituted, either by the construction of dwellings raised on piles driven into the beds of lakes, or by the formation of artificial mounds with the materials dug out of a ditch around them, thus providing by one operation an elevated site, and surrounding it with a defence which increased its inaccessible character.

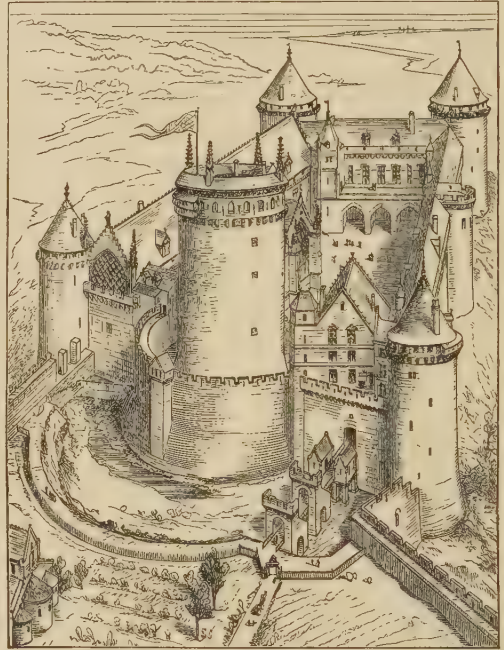
A mixed style was also frequently adopted, in which a naturally strong position was rendered more secure by the construction of ditches and mounds around it. Kelts, Saxons, and Danes do not seem to have built castles in our sense, their defensive works being for the commune, not the chief. From Northern France the early Normans introduced into England, Scotland, and Ireland the 'motte' or mote, till of late referred to their predecessors, the artificial mound surrounded by a ditch, fortified with a palisade, and crowned by a wooden castle. 'Motte' (O. Fr. *motte*, *mote*, a clod, hillock) has been confused with 'moot' (Old Eng. *mót*, meeting). In Southern France, where

Roman civilisation lasted longer than in the north, the *castra stativa* formed the model for the defences of the castle, while the arrangements of the Roman 'villa' were continued in the country houses. Not till the 12th or 13th century did the 'Edwardian castle' or 'Norman keep' supersede in England the wooden tower or keep with its bailey. The Norman keep consisted of a square or oblong tower, the walls of which were built with stone and mortar, and were always of great thickness. It relied for its defence on the passive resistance of its solid walls to all the appliances which the engineering of the time could bring to bear upon them. The basement was vaulted and had only very narrow openings in the walls for air. The entrance-door was usually on the first floor, and was approached either by a movable ladder, or by a stone staircase erected in a well-defended tower or 'forework' built at one side of the keep. On the first floor was the hall, or common room, where all the inhabitants of the castle took their meals and slept, except its lord, who with his family occupied the apartment on the second floor. The top was crowned with a battlement from which the active defence was carried on. These castles had courtyards attached to them which were called the outer and inner 'bailey,' and the keep was frequently placed at the wall dividing the courtyards.

In the 13th century the art of attack and defence had greatly improved, and it was found necessary to a large extent to modify the simple Norman system. The passive solidity of the keep no longer sufficed to save it from the operations of the sappers, and the principle was gradually evolved in military architecture that 'that which defends must be itself defended.' Hence arose the system of strengthening the walls of enceinte of the courtyards, and of constructing all around them a series of towers, attached to but projecting boldly from the walls at short intervals, so as to permit the defenders to watch and guard the intervening 'curtains' or straight portions of the walls of enceinte, with flank fire from the battlements of the towers. The whole structure thus became a great 'castle,' each portion serving as a defence to the rest. Each tower was also so arranged as to form a small independent fort, capable of maintaining a separate defence, and the keep was still preserved as the residence of the commander, and as a last refuge in case of need. Every portion of the castle had thus to be assaulted separately—the fall of one wall or one tower did not imply the surrender of the stronghold, and even after all the walls and towers connected with them had fallen, the commander with his household retainers might yet maintain a stubborn resistance in the keep while their provisions lasted. Of the fortresses of this period the great castle of Couci in the north of France is the typical example; and Carnarvon, Caerphilly, and other specimens of what is called the Edwardian style, are well-known English illustrations. These castles, though strong in war, were dull and lonely places of abode in peace, and as civilisation advanced and manners softened, the lords and their families forsook the gloomy keeps and preferred to dwell in halls and private rooms erected in the inner courtyard and ranged along the outer walls, so that from windows therein they might enjoy a view over the surrounding country and what went on abroad. These apartments gradually increased in number, until in the 15th century the castles of the nobles became not only impregnable fortresses, but splendid palaces. The castle of Pierrefonds, near Compiègne, built in 1390, and restored in 1865 by M. Viollet-le-Duc, gives a noble idea of the magnificence and grandeur of these palatial residences. In England the castles of Warwick, Kenilworth, Bodiam (Sussex, near

Rye), &c., show the same combination of powerful military and elegant domestic architecture.

But a new agent in the art of war was at hand, before which these proud strongholds had after a



Castle of Couci (from Viollet-le-Duc).

short and bitter struggle to succumb. Believing them impregnable before the introduction of gunpowder in sieges, the nobles could not for a long time bring themselves to admit that their feudal fortresses were no longer able to shelter them from the assaults of artillery; but by-and-by this truth was forced upon them, and then recognising the uselessness of their gloomy walls, they vied with one another in throwing them down, so as to open up their abodes and render them, after the manner of the Italian villas, pleasant and cheerful country residences, with scarcely a feature suggestive of defence. It was now freely admitted that fortresses must henceforth consist of separate and much greater structures than were compatible with the resources of even the most powerful nobles, and that they might better be left in the hands of the government.

Although the country residences of the nobles erected after this time (16th century) still partook of the old character in their external aspect, and exhibited the same appearance of towers and battlements, loopholes and drawbridge, these features were no longer employed for use, but only from habit and a desire to maintain the traditional dignity and importance of the castle. The château of Sully-sur-Loire is a good specimen of the manner in which the later castellated style was carried out in France. The name, too, of 'castle' or 'château' often survives and dignifies a defenceless country mansion. Finally the spread of the Renaissance swept away the few remaining symbols of castellated architecture, and introduced in its place the symmetrical and open style of the 17th century. Many of the transition examples are, however, of great interest and beauty, and compose the great bulk of the picturesque and well-known châteaux of France. Our Scottish castles of the time of James VI. also owe much of their

picturesque effect to the mixture of castellated or defensive features with the enlargement and improvement of domestic accommodation.

See HILL-FORTS, LAKE-DWELLINGS; Viollet-le-Duc, article 'Architecture Militaire' in the *Dictionnaire* (1854-69); Parker, *Domestic Architecture of the Middle Ages* (1853-60); G. T. Clark, *Medieval Military Architecture* (1884); MacGibbon and Ross, *Castellated and Domestic Architecture of Scotland* (5 vols. 1886-92); Mackenzie, *The Castles of England* (2 vols. 1896-97); G. Neilson, *The Motes in Norman Scotland* (1898); Orpen, *The Normans in Ireland* (1901); Mrs Armitage, *The Early Norman Castles of the British Isles* (1912); A. H. Thompson, *Military Architecture in England* (1912); H. G. Evans, *Castles of England and Wales* (1912).

Castlebar, the capital of County Mayo, Ireland, 152 miles NW. of Dublin by rail. Here the Irish in 1641 massacred the English garrison. In 1798 the French general, Humbert, held the town for a fortnight. Pop. 3700.

Castlecary, a market-town, with railway station, Somersetshire, 12½ miles NNE. of Yeovil. —Also a railway station, and old castle, 6½ miles SW. of Falkirk, Stirlingshire, near one of the stations of Antonine's Wall, excavated in 1902.

Castle Douglas, a town in Kirkcubrightshire, on Carlingwark Loch, 9 miles NE. of Kirkcubright, with sheep and cattle marts; pop. 2800.

Castleford, a town in the West Riding of Yorkshire, on the Aire, 10 miles SE. of Leeds, manufactures bottles and jars; pop. 24,000.

Castle Garden, originally Castle Clinton, a round fort (1807) built 300 yards out from the south end of Manhattan Island, was in 1824 converted into a place of amusement; in 1839 planted with trees, turf, and flowers; in 1847 again transformed into an opera-house; and in 1855 made the immigration depot of New York. In 1890 this depot was transferred to Ellis Island in New York Harbour. A public aquarium was established on the site of Castle Garden.

Castlemaine, a town of Victoria, 77 miles NNW. of Melbourne by rail. The gold-diggings here were among the first discovered in Australia. Pop. 7000.

Castlereagh, ROBERT STEWART, VISCOUNT, was born 18th June 1769, the son of an Ulster proprietor, who in 1789 was created Baron Londonderry, in 1795 Viscount Castlereagh, in 1796 Earl, and in 1816 Marquis, of Londonderry. Robert was educated at Armagh, and, after a twelve-month at St John's College, Cambridge, was making the grand tour of Europe when in 1790 he was summoned home to enter the Irish parliament as Whig member for County Down—the election cost his father £60,000. He turned Tory in 1795, and next year became Keeper of the Privy Seal; but he continued a steadfast supporter of Catholic emancipation. Still, he believed that emancipation with an independent Irish parliament would mean simply a transference of tyranny from the Protestant oligarchy to a Catholic democracy; hence, as Chief-secretary from 1797, he bent his whole energies to forwarding Pitt's measure of Union. That measure was carried in 1800, largely through Castlereagh's skill in buying up the borough-mongers; but Pitt's pledges to the Catholics were defeated by George III.'s bigotry, and Castlereagh with Pitt retired from office.

Transferred by the Union from Dublin to Westminster, he accepted office in the weak Addington ministry (1802) as President of the Board of Control; but the true second era in his career was as War Minister under Pitt from July 1805 to January 1806, and again under Portland from April 1807 to September 1809. The bombardment of Copenhagen

and seizure of the Danish fleet, the extension of the war to the Peninsula, and selection of Wellesley for general, may be set off against the disastrous Walcheren expedition; and even that was a brilliant conception, marred only by the king's obstinacy in giving Lord Chatham the command. Anyhow, Castlereagh was made the scapegoat, and the shilly-shally behaviour of his colleagues caused him to challenge his great rival, Canning. On 21st September 1809 they met upon Putney Heath, and, at the second fire, Canning received a slight wound in the thigh, whilst Castlereagh escaped with the loss of a button.

His real greatness begins with March 1812, when, as Foreign Secretary under Lord Liverpool, he became the soul of the coalition against Napoleon, which, during the momentous campaigns of 1813-14, was kept together by him, and by him alone. 'Time,' Green acknowledges, 'has long ago rendered justice to Castlereagh's political ability, disguised as it was to men of his own day by a curious infelicity of expression; and the instinctive good sense of Englishmen never showed itself more remarkably than in their preference at this crisis of his cool judgment, his high courage, his discernment, and his will, to the more showy brilliancy of Canning.' He represented England at the congresses of Châtillon and Vienna (q.v.) in 1814-15, at the treaty of Paris in 1815, at the congress of Aix-la-Chapelle in 1818; and he was preparing to start for a congress at Verona, when, on 12th August 1822, in a fit of insanity, he committed suicide with a penknife at Fooks Cray, his Kentish seat.

England and Europe owe much to Castlereagh for the forty years' peace that succeeded Napoleon's downfall. Yet no statesman, save Strafford, was ever pursued with more rancorous hatred—a hatred that raised a shout of exultation as he was borne to his grave in Westminster Abbey. Green notwithstanding, to many even at the present day he is still the cold-blooded repressor of the Irish rebellion, the 'executioner in enamel,' the sympathiser with the Holy Alliance, the tool of Metternich, Queen Caroline's persecutor, and the author of the Peterloo massacre and the coercive 'Six Acts' which, if the words of our former edition were true, 'will for ever stamp his name with infamy.' His failings have been exaggerated, his splendid services in diplomacy lost sight of or tardily recognised; but, in truth, as a minister, Lord Castlereagh was not lovable.

He had succeeded his father as second marquis in 1821, and leaving no issue by his accomplished wife, a daughter of the Earl of Buckinghamshire, whom he married in 1794, was himself succeeded by his half-brother, Sir Charles Stewart (1778-1854), soldier, diplomatist, military historian, and founder of Seaham Harbour.

See Castlereagh's *Correspondence and Despatches* (12 vols. 1847-53); the Life by Sir A. Alison (1861); one of Lord Salisbury's *Essays* (repub. 1905); and the short Lives by the Marchioness of Londonderry (1904) and G. Hassall (1909).

Castleton, (1) capital of the Peak (q.v.) district, Derbyshire, 10 miles NE. of Buxton, is commanded, to the south, by the ruined castle of William Peveril, natural son of the Conqueror. —(2) A Liddesdale parish, in Roxburghshire. —For another Castleton, see BRAEMAR.

Castletown (*Manx Balley Cashtal*), a seaport and former capital of the Isle of Man, on Castletown Bay, 11 miles SW. of Douglas by rail. Castle Rushen, now a prison, occupies the site of a Danish fortress of the 10th century, which was almost wholly demolished by Robert Bruce in 1313. The grounds of Rushen Abbey (11th century), near the station, are now market-gardens.

Hard by is the small building where the House of Keys assembled for about 170 years. Brewing, tanning, and lime-burning are carried on. Near Castletown is King William's College (1833), an Elizabethan pile, rebuilt after the fire of 1844, and enlarged in 1862. Pop. 2000.

Castor and Pollux, often called *Dioscuri* or 'sons of Zeus,' were according to Homer the sons of Leda and Tyndareus, and so brothers of Helen of Troy. Another tradition made both of them sons of Zeus and Leda; a third made only Pollux Zeus's son, and so alone immortal. Castor was famous for his skill in managing horses, Pollux for his powers in boxing. Both received divine honour at Sparta as patrons of travellers by sea; the Romans they assisted at the battle of Lake Regillus. One story tells that when Castor, the mortal, was killed, Pollux prayed Zeus to let him die with him, and was permitted either to live as his immortal son in Olympus, or to share his brother's fate and live one day in heaven with the gods, the other among the shades. Zeus placed the brothers amongst the stars as *Gemini*, and their names are attached to the principal stars in that constellation. Their names are also given to the electric phenomenon known as St Elmo's Fire.

Castoreum, a soft brown substance, of peculiar smell and taste, secreted by two pear-shaped glands, associated with, but quite distinct from, the reproductive organs in both sexes of beaver. It is now used chiefly by perfumers, but was from the time of Hippocrates regarded as having a specific influence on the uterus, and esteemed as a soothing medicine in hysteria, catalepsy, cramp, and other spasmodic diseases. In commerce it appears in the two glandular sacs as removed from the animal. In Hudson Bay trade, ten pairs of glands used to be equal in value to one skin, and Russian castoreum was yet more valuable. See BEAVER.

Castoridae, a family of rodent mammals, in the squirrel-like section, represented by the genus *Castor* with a single species, the familiar Beaver (*Castor fiber*). The swimming habit, the massive skull, the rounded angle of the lower jaw, and the peculiar molar teeth are among the more distinctive characters. See BEAVER.

Castor-oil, a fixed oil obtained from the seeds of the castor-oil plant. In extracting the oil, the seeds are first bruised between heavy rollers, and then pressed in hempen bags under a hydraulic or screw press. The best variety of oil is thus obtained by pressure in the cold, and is known as *cold-drawn* castor-oil; but if the bruised and pressed seeds be afterwards steamed or heated, and again pressed, a second quality of oil is obtained, which is apt to become partially solid or frozen in cold weather. In either case, the crude oil is heated with water to 212° (100° C.), which coagulates, and separates the albumen and other impurities. Exposure to the sun's light bleaches the oil, and this process is still resorted to, but since the introduction of the nearly tasteless Italian castor-oil, which in itself is almost colourless, there is not the same demand for the bleached article. When pure and cold drawn, castor-oil is of a light-yellow colour; but when of inferior quality, it has a greenish, and occasionally a brownish tinge. It is somewhat thick and viscid. Its specific gravity is high for an oil, being about .960. It is miscible with alcohol or spirits of wine and ether. Reduced to a temperature of 0° (-18° C.), it does not become solid; but exposed to the air, it very slowly becomes rancid, then dry and hard, and serves as a connecting link between the drying and non-drying oils. The commoner qualities have a nauseous smell, and an acrid, disagreeable, and sickening taste, but the fine medicinal article is frequently almost free from

those objectionable properties. Repeated attempts have been made to obtain from it an active principle, to which it might owe its purgative properties, but without success. It, however, contains a peculiar oily acid, called Ricinoleic Acid, $C_{18}H_{34}O_2$.

Castor-oil is one of the most convenient and mildest of purgative medicines. Given in doses of one or two tea-spoonfuls, it forms a gentle laxative for those who are easily acted on by medicine; while a dose of a table-spoonful, or a little more, will almost always succeed if it remains on the stomach. The only serious objections to the use of castor-oil are its flavour and the sickness often produced by it. It may be administered floating on peppermint or cinnamon water, or on coffee, or shaken up with glycerine. But the most effectual plan for disguising the disagreeable flavour is to inclose it in thin gelatin capsules, holding as much as a tea-spoonful or more.

The adulterations of castor-oil may be various. Several of the fixed oils, including lard, may be employed. The best test of its purity is its complete solubility in its own volume of absolute alcohol. It is used also as a lubricant, for soap-making, and in India for burning in lamps. Croton-oil is occasionally added.

CASTOR-OIL PLANT (*Ricinus communis*; natural order Euphorbiaceæ) is a native of India, but now



Castor-oil Plant (*Ricinus communis*).

naturalised in most tropical, subtropical, and even warm temperate countries. It is known in the Mediterranean countries as *Palma Christi*. It is also found in cultivation even in northern Europe, where, however, it is only annual. Under these circumstances it attains a height of 4 to 6 or more feet, while in warmer climates it becomes a small tree. The flowers are comparatively inconspicuous, in monœcious racemes, but the foliage is peculiarly handsome. There are a large number of varieties, many described as distinct species.

Castrametation is the art of forming a Camp (q.v.).

Castration is the method by which animals, both male and female, are deprived of parts of their generative organs (testicles and ovaries). They are in consequence rendered more valuable for working purposes, and also tend to grow and fatten much more quickly for the butcher. A castrated horse is called a gelding; a castrated bull, a bullock or steer (Scots, 'stot'); a castrated boar, a hog; and a castrated ram, a wether. These are the ordinary male animals operated on in this country, but occasionally cocks are castrated, and are then called capons. Castration of females is called 'spaying,' and is frequently performed upon sows, which are then called gelts. In the male animal, after he has been properly secured, an incision is made into the testicular sac, and each testicle removed, either by torsion, by actual cautery, by caustic clam, or by scraping the cord. In the female animal an incision

is made in the right flank, and each ovary removed through the opening, which is then stitched up. The operation is followed by several dangers, such as blood-poisoning, lock-jaw, hernia, hemorrhage, scirrhus cord, &c. See EUNUCH, where also the subject of *castrati* singers is dealt with.

Castren, MATHIAS ALEXANDER, the founder of Ural-Altaian philology, was born in 1813 at Tervola in the north of Finland. He received his earliest instruction in the town of Tornea, and afterwards studied at Helsingfors (1830-36). In 1838 he undertook a pedestrian excursion through Finnish Lapland, in order to extend his knowledge of the language and literature; and, in 1839, another through Karelia, to collect ballads, legends, &c., illustrative of Finnish mythology. On his return, he published in Swedish a translation of the great Finnish epic, the *Kalevala* (q.v.). During 1841-45, conjointly with Lönnrot, he prosecuted his researches among the Finnish, Russian, and Norwegian Laplanders, as also among the European and Siberian Samoyeds; whilst, as linguist and ethnographer to the St Petersburg Academy, he, between the years 1845 and 1849, extended his laborious investigations as far east as China, and as far north as the Arctic Ocean. On his return he was appointed professor of the Finnish language and literature at the university of Helsingfors. He employed himself in preparing for publication the vast materials which he had collected, but died 7th May 1852, from exhaustion—a martyr to science. The six works published before, and the twelve after his death, are mostly in Swedish, but the greater number have been translated into German. They include accounts of his travels, lectures on Finnish mythology and the Altaian races, grammars, vocabularies, &c. See his Life by J. W. Snellman (1870). A son, Robert Castren (1851-83), wrote several monographs on Finnish history.

Castres, a town in the French department of Tarn, is situated on both sides of the river Agout, 46 miles (72 by rail) E. of Toulouse. It rose up around a Benedictine abbey, which was founded in 647; and in the 16th century it became a Huguenot stronghold, but its fortifications were demolished in 1629. The present town has beautiful promenades, shaded by fine alleys of trees, a quondam cathedral, and important manufactures of fine wool dyed goods, as also manufactures of leather, paper, soap, &c. Pop. 25,000.

Castri. See DELPHI.

Castro, the modern name of the capital of several islands of the Grecian Archipelago—Lesbos, Samothrace, Melos, Lemnos, &c.

Castro, GUILLÉN DE, a Spanish dramatist, in the judgment of Voltaire the writer of the first true tragedy that had appeared in modern Europe, was born in Valencia in 1569, and was at one time commander of a Neapolitan fortress. In his later years he lived in Madrid, and was on intimate terms with Lope de Vega; but his sour temper lost him many friends, and he is said to have died in abject poverty in 1631. Castro's memory has been chiefly preserved by his authorship of *Las Mocedades del Cid*, to the first part of which Corneille was indebted for the plot and many of the beauties of his celebrated tragedy. The second part of the *Mocedades* has few passages that rise above mediocrity; and his other plays are badly constructed, and chiefly distinguished for their intensely national spirit. See Ticknor (1849), B. Clarke (1893), and Fitzmaurice Kelly (1898) on Spanish literature.

Castro, INEZ DE, the daughter of a Spanish nobleman, in 1340 came to Portugal in the train of her cousin, Costança, the bride of the young Infante, Dom Pedro. Her beauty captivated him,

and, after Costança's death in 1345, he made her his mistress, in 1354 his wife. The secret of the marriage was revealed to his father, Alfonso IV.; and with his consent the hapless Inez was stabbed to death in January 1355. In 1360, three years after Alfonso's death, Pedro executed two of the three murderers with horrible tortures, whilst the corpse of Inez herself, clad in royal attire, was seated on a throne, and received homage as queen. So, at least, runs the tradition, immortalised by Camoens; but all that is certain is that her body was reinterred with great splendour at Alcobaça.

Castro, JOÃO DE, a famous Portuguese soldier and traveller, born at Lisbon in 1500. In his boyhood he showed a remarkable aptitude for study, but at eighteen he chose for himself a life of adventure by volunteering against the Moors at Tangiers. He next accompanied Charles V. to Tunis, and had already fought and travelled in the East, when in 1545 he sailed to the Indies at the head of a small expedition. Here he covered himself with glory by the overthrow of the Mohammedans, and by the heroic relief and defence of Diu. For these exploits he was appointed Portuguese viceroy, but did not live to enjoy the dignity, dying in the arms of Francis Xavier in June 6, 1548. His Life, by Andrada (1651), was translated into English in 1664.

Castro del Rio, a town of Andalusia, Spain, situated on the Guadajoz, 23 miles SE. of Cordova. It has manufactures of woollen and linen fabrics, earthenware, &c., and considerable trade in agricultural produce. Pop. 15,000.

Castrogiovanni, a town in the middle of Sicily, 56 miles E. of Catania by rail, on a remarkable fertile plateau, which rises precipitously to a height of 3270 feet above sea-level. Castrogiovanni occupies the site of the ancient *Enna*, of which Ceres was the presiding goddess, and here was her most famous temple. The neighbourhood was the fabled scene of the rape of Proserpine. In connection with the Punic and Servile wars, Enna played a conspicuous part in early history. A castle and other buildings of Saracenic origin are still standing. Pop. 26,000.

Castro Urdiales, a town on the north coast of Spain, on a rocky headland, 30 miles ESE. of Santander, with a safe roadstead; pop. 15,000.

Castrovillari, a town of south Italy, 34 miles N. of Cosenza, on an eminence surrounded by mountains. It has a trade in wine, manna, silk, &c. Pop. 10,000.

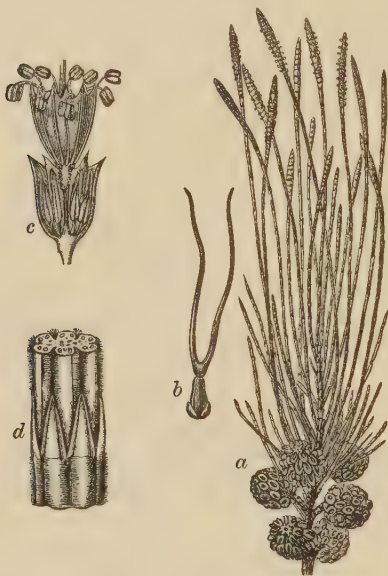
Castruccio-Castracani (1281-1328), born at Castruccio near Lucca, was exiled in his youth with his Ghibelline relatives. After a distinguished career as a soldier of fortune in England, France, and Lombardy, he was recalled, defeated the Guelphs at Montecatini (1315), assisted and was imprisoned by Uguccione of Pisa, and routed the Florentines at Altopascio (1325). At first a partisan of Frederick of Austria, he afterwards joined Ludwig the Bavarian, who made him Duke of Lucca, Pistoja, Volterra, and Luni (1327).

Cast-steel. See IRON.

Casualties of Superiority, in the feudal law of Scotland, such emoluments arising to the superior as depended on uncertain events. The casualties of ward, marriage, and recognition were abolished along with the military tenure of wardholding, of which they were incidents, shortly after the Jacobite rebellions. The casualty of 'non-entry' was, strictly speaking, abolished by the Conveyancing Act of 1874; and after that statute the only casualties remaining in force were liferent-escheat (see ESCHEAT), relief, and composition. The Act of 1874 enacts that in feus granted after

1st October 1874 no casualties are exigible in law, apart from express covenant, and that payments of the nature of casualties cannot thereafter be stipulated for unless they are fixed in amount and made payable at definite intervals. Casualties incident to a feu created before that date, which were not of fixed amount and payable at fixed intervals, were rendered redeemable at the instance of the feuar. By the Feudal Casualties Act, 1914, all casualties, including duplicands of feu-duties or ground-annuals, are made compulsorily redeemable at the instance of either superior or feuar. If not redeemed within fifteen years they are extinguished.

Casuarina (Cassowary tree), a peculiar genus forming the order Casuarineæ, of problematical position. Treub discovered in 1891 that the Ovule (q.v.) is fertilised by the chalazogamic method; and it has been proposed, therefore, to separate Casuarina from all other Angiosperms as 'Chala-



Branch of *Casuarina equisetifolia*:

With male and female flowers, the former in catkins at the end of the shoots, the latter (a) crowded in cone-like heads. At b, note single female flower, and at c, a group of male flowers. A section of the fluted stem, with reduced leaves, is represented at d.

zogamæ,' with affinities to Gymnosperms. See CHALAZA. Of the 30 species, the great majority are restricted to Australia and the adjacent islands. Some of them are large trees, producing timber of excellent quality, hard and heavy, the *Beef-wood* of the Australian colonists. Other species are scrubby bushes, and all have a very peculiar appearance, their branches being long, slender, wiry, drooping, green, jointed, with very small scale-like sheaths instead of leaves. They thus curiously resemble arborescent Equisetaceæ.

Casuistry, in the widest sense, is the reasoning which enables a man to decide in a particular case between conflicting, or apparently conflicting, duties. Against casuistry so understood no reasonable objection can be raised. Instances of it may be found in the gospels, in the epistles of St Paul, and in the early fathers. Indeed, St Augustine, in his little works *De Mendacio* and *Contra Mendacium*, may be said to have written casuistical treatises. Gradually, however, casuistry developed within the Catholic Church to an extent which is nothing less than a change in kind, and

must radically affect the judgment formed of its merits or demerits. First of all, the ecclesiastical canons became more and more elaborate in their enumeration and classification of grave offences, for which certain definite punishments were due, and, more and more, what had been at first a public discipline was transferred to the court of conscience. Only, it was not the individual conscience which passed sentence in place of the bishop's court. The sins were submitted to the judgment of the priest in secret confession, and for this purpose he was bound to provide himself with a 'penitential book'—i.e. with a summary of the penalties attached to particular sins by the law of the church. These books were in use from the 7th to the 13th century. Another great change occurred in 1215, when the fourth Lateran Council made the confession of every mortal sin to the priest a matter of obligation on all Christians. Then, and not till then, casuistry, in the modern sense, began to be. It is generally known among Roman Catholics as 'moral theology,' and may be defined as the science of the confessional. It professes to decide on the nature of all possible actions, to determine when any particular action is sinful or innocent, to distinguish between binding duty and that which is praiseworthy but not obligatory. It weighs motives and intentions, decides the relative gravity of sins, and the aggravating or extenuating circumstances attending them. Instead of stepping in like the casuistry of the early Christians in doubtful cases, it undertakes to regulate all moral action, covering the whole extent of life and entering into each detail. Instead of giving a list of legal punishments imposed by the church, it anticipates the judgment of God in the world to come. This of course requires an examination of actions in detail, which is often ludicrous or repulsive, always unreasonable. Does a man who steals four shillings commit a mortal sin or only a venial one? in other words, is he liable thereby to the punishment of hell or only of purgatory? Does a man who blasphemes twenty saints at once commit twenty sins, or only one? Are we bound under mortal sin to pray once a month, or only once a year? Such are the questions discussed in every manual of casuistry. They are settled by Scripture, reason, the canons of the church, and the opinion of eminent theologians. A further development dates from the introduction of the system known as Probabilism, first propounded by a Spanish Dominican, Medina (1528-81). It rests upon the theory that the moral law does not bind in cases when it is doubtful, and that it may be considered doubtful if theologians of name have denied that it binds in the particular cases. We have only to consider the endless discussions which these theologians have raised on points of practice, to form some idea of the laxity to which this system leads. Adopted by most of the Jesuits, it was hated 'as a pest of morality' in France, where it was exposed in the Provincial Letters of Pascal, and condemned by the General Assembly of the clergy in 1700. But since the French Revolution it has obtained an exclusive supremacy in the Roman Catholic Church, and at this day no other system is ever thought of.

The name of casuists is legion. The *Summa de Casibus Penitentialibus*, by St Raymund of Pennafort, is among the earliest works on the subject. He flourished about 1228, and his book was followed by a multitude of others with similar titles. The highest authority was attained by St Alfonso Liguori, who wrote in the middle of the 18th century; and the 'Sacred Penitentiary' at Rome has declared that every confessor may safely follow all his opinions. Modern manuals, chiefly based on Liguori, have been written by Scavini,

Gury (annotated by Ballerini), Lehmkuhl, and others. The objections which Luther made, and which Protestants still feel, to the casuistry described above, are directed against its radical principle and not merely its details. The New Testament, they think, teaches that a man is justified by surrendering himself entirely to God through Christ, and it knows nothing of an elaborate system of law, of which a minimum must be observed as the condition of salvation. They believe that a man's own conscience, enlightened by Christian teaching and example, will generally leave him in little doubt as to his duty, and they object to the constant discussion of moral questions, to the desire to ascertain how little we are bound to do, as ruinous to the moral sense. They deny that the subtleties of a pretended science can ever gauge the amount of sin involved in a particular action. God alone can distinguish between the sudden fall which happens in spite of a man's real character and the sin which reveals his inner corruption. Above all, they object that the so-called science must needs rest in the hands of the priests, and that practically a layman must cease in great measure to have a conscience of his own. A few Protestants—e.g. Jeremy Taylor, and the Puritans Perkins and Amesius—have produced casuistical books, but they deal with cases of special difficulty, and are not in the same sphere as the Roman casuistry. Besides, such Protestant works have long since fallen into desuetude, and it has been agreed that any elements of utility in casuistical discussion may be safely relegated to ethics and pastoral theology. See MacCunn's *Making of Character* (1890); and see Sidgwick's *Methods of Ethics* for what is substantially a criticism of casuistry.

Casus Belli, an occasion of war, is the reason alleged by one power for going to war with another, such as defence of independence, redress of grievances, satisfaction for dishonour to the flag, or enforcement of treaty obligations. See ARBITRATION, ENEMY, INTERNATIONAL LAW, PEACE.

Cat, a name applied to various species of the genus *Felis*, in the family *Felidae*, and in the *æluroid* section of *carnivora*. This *æluroid* section includes the most specialised carnivores; and the members of the genus *Felis*, including lion and tiger, panther and cat, exhibit carnivorous characteristics in their highest perfection.

General Characters of Cats.—The canine teeth of *Felidae* are large and strong, the true molar teeth reduced to one on each jaw, the molar of the lower jaw and the last premolar of the upper jaw function as special cutting (sectorial) teeth, the face portion of the skull is short and broad, the auditory bone bulbs (bullæ) are large, rounded, smooth, and divided by an internal septum. The feline carnivores walk on the tips of their toes, in digitigrade fashion; the claws are large, strong, sharp, and completely retractile. The iris is very movable, and the aperture contracts to a vertical slit. The tongue is covered with sharp rough papillæ. The cæcum on the intestine is small and simple. There are many other more technical structural characters. The *Felidae* are conspicuously carnivorous in their diet. Domestic cats eat fish when they can get it; and the Indian Fishing-cat (*F. viverrina*) feeds on fish and even molluscs. They hunt alone and stealthily, surprising their victim by a sudden spring, loving darkness, hating water, and in most cases are more or less arboreal.

Species.—The genus *Felis* includes some fifty species, the distinctions of which are somewhat difficult. Among the Old-World species, the most familiar are the lion, tiger, leopard or panther, ounce, wild cat (*F. catus*), and domestic cat.

Among the New-World species, the puma, cougar or American panther (*F. concolor*), the jaguar, the pardal (*F. pardalis*), the pampas cat, are common forms. The term lynx is applied to several different species, and the name cat is used with equal width. The Cheetah (q.v.) is often regarded as a distinct genus.

Wild Cat.—The Wild Cat (*F. catus*) found in the woods of Europe was common in England in the middle ages, when abbesses were forbidden to wear furs more costly than those of lambs or cats; in Wales it lingered on almost till the present day. The wild cat said to have been killed in Lincolnshire in 1883 was probably, like most recent 'wild cats' reported in England, only a domestic cat that had taken to the woods. The true wild cat was found in Yorkshire as late as 1840; in the Lake District an undoubted specimen was killed in 1843. In most parts of Scotland the wild cat is now extinct, but, according to Mr Harvie Brown, is still found northward and westward of a line from Oban by Dalnally along the Perthshire border to Tomintoul, and thence to Inverness. In Perthshire it died out rapidly after 1850, though specimens were found in 1850, 1870, and 1871; in Wigtown, Dumfries, and Kirkcudbright it has not been seen since 1832. According to Mr J. G. Millais, who has gone carefully into the subject in his magnificently illustrated *Mammals of Great Britain and Ireland* (1904), the main stronghold of the wild cat of to-day is northern and western Inverness and western Ross-shire. It is found, or was lately, in Spain, France, Switzerland, Germany, Poland, Dalmatia, Greece, Transylvania, and across south-eastern Europe, into northern Asia. It is stronger and larger than the house cat, with stouter head, shorter and thicker tail, more abundant whiskers, and in the male with deep black soles. Mr Millais shot an exceptionally fine specimen, 3 feet 10 inches from nose to tip of tail, at Kinloch-Moidart, in Inverness-shire, in October 1899. The predominant colour is yellowish gray, a dark stripe runs along the back, darkish stripes down the sides, cross bands on the legs, and rings on the tail. It is very savage in disposition. The female has its litter in a hollow tree or rock cleft. Though a large number of the 50 species of *Felis* have received special popular titles, like lion, tiger, ounce, &c., there remain a large number to which the title 'wild cat' is quite as applicable as it is to the more familiar *F. catus* of Europe.

Domestic Cat—History.—Our common cat, familiar in many varieties of colour, is not a tamed descendant of this Wild Cat (*F. catus*), but seems, like other domestic animals, to have come from the East. It is usually, though not indeed with absolute certainty, regarded as the descendant of the Egyptian Cat (*F. caligata* or *maniculata*), which was certainly domesticated in Egypt thirteen centuries B.C. That the taming should have taken place in the 'granary of the ancient world' is very natural. From Egypt the domestic cat spread through Europe, certainly before the Christian era, but at first sparsely, and confined to those who could afford a high price for the pet. It is quite possible that other species may have been domesticated elsewhere, and have mingled with the Egyptian breed. Rolleston and others have believed that the domestic mouse-killer of the ancient Greeks and Romans was not the cat at all, but the white-breasted Marten (*Mustela foina*), for which *felis* is good Latin.

In the middle ages cats were often kept in nunneries, and this may have something to do with their traditional association with old maids. Of its rarity in Britain in former times, when the wild cat was common in all the woods which

covered so much of the island, a curious evidence is afforded by a Welsh law quoted by Pennant—a law of the reign of Howel the Good, who died in 938 A.D.—fixing the prices of cats according to their age and qualities, beginning with a price for a kitten before it could see, and enacting that if any one stole or killed the cat that guarded the prince's granary, he was to forfeit a milch ewe, its fleece and lamb; or as much wheat as when poured on the body, suspended by its tail, the head touching the floor, would form a heap high enough to cover the tip of the tail.

Varieties.—The varieties of domestic cat, though numerous, are trivial, and mostly concern colour and quality of fur, not differences of form as in dogs. Thus we have (1) black cats with clear yellow eyes, usually with a few white hairs, and with hints of markings in the kittens; (2) white cats, sometimes with blue eyes, and then generally deaf; (3) tabby cats, like the wild species, and perhaps the result of crossing with the same; (4) gray cats, which are rare, and differ from the tabby forms in having no black stripes, except the common ones over the fore-legs; (5) tortoise-shell, fawn-coloured, and mottled with black, usually females; (6) sandy-coloured, usually males. A true tortoise-shell tom-cat fetches a big price. The royal Siamese cat is fawn-coloured, with blue eyes and small head; the Carthusian or blue cat has long dark grayish-blue fur, with black lips and soles; the Angora or Persian cat is large, finely furred, generally white, tending to yellow or gray, and possibly derived from an Asiatic species. The Malay cat, in Pegu, Siam, and Burma, has a tail only half the normal length; the Manx cat of the Isle of Man is tailless and has longer hind-legs. Long-tailed forms, probably due to intercrossing, also occur in Manxland, and curtailed forms occur in the Crimea. No cats with pendent ears exist, in spite of frequent statements to the contrary. In South America, not to mention other varieties, there is said to be a race of cats which do not 'caterwaul' at nights, and Professor Mivart justly remarks that 'it is to be wished that this breed could be introduced into this country.' Abnormalities, such as absent fore-limbs and the like, have been repeatedly recorded.

Characteristics.—The domestic cat is too well known to require description. It has been known to attain a weight of 23 lb., and an age of eighteen years. Though thoroughly domesticated, it retains many characteristics of wildness, especially in its private hunting expeditions, nocturnal amatory wanderings, unsocial habits, and generally self-centred, not entirely confident disposition. When turned out in the woods, it usually adapts itself readily. Domestication has had a different influence on cat and on dog, and the former may be fairly said to have surrendered itself less. In normal surroundings it is an expert hunter or stalker of birds and small mammals, and is often known to bring home rabbits; at the same time it has a marked predilection for food which it could not obtain if wild—e.g. milk, cheese, fish, and the like. Its sense of smell has probably degenerated, but is still very sensitive to certain favourite odours. The great dilatibility of the pupil enables it to make the most of feeble light. The cat is very prolific, mature by the end of her first year, fecund till the ninth, bringing forth often three or four times in a year. It is not necessary to say anything about its familiar purring, mewing, and spitting; about its aversion to water and love of warmth; its scrupulous and painstaking cleanliness; about its dexterous movements and patient watching for prey; or about the delight in cruelty (comparatively rare in other animals) which characterises its treatment of captured mice. The dry fur, free from any

oily matter and readily injured by water, becomes highly electric by friction, especially in dry or frosty weather.

Intelligence.—In cats the senses of sight, hearing, and touch are very highly developed, and the intelligence is proportionately great. That they exhibit great adroitness in catching their prey is well known, but the climax is reached in certain recorded cases where a young bird was used as a decoy for its parents, and where crumbs were scattered or scraped from beneath the snow to attract sparrows. That they bring zoological curiosities to their mistresses, that they may learn without teaching to 'beg' like dogs for food, that they show for a while considerable interest in the looking-glass problem are not unfamiliar facts, while more rarely they have been known to combine reasoning and manual dexterity in opening thumb-latches, working knockers, ringing bells, or even turning an easy lock. G. J. Romanes collected illustrations of the above, and closes his account with the remarkable case of a cat which, being accidentally ignited by paraffin, ran 100 yards and plunged into a trough of water. See his *Animal Intelligence* (1882).

Emotions.—The sexual emotions of cats are well known to be very strong, and their maternal kindness and solicitude are equally pronounced. From the time of Buffon, the cat has been usually reproached for liking places more than persons, but while there is much truth in the familiar observation, many cases of genuine fondness for owners are well known. They sometimes show great power of finding their way home under the impulse of home-sickness, and often show much careful love in concealing and transplanting their young. The case of a cat which ran for help for an endangered parrot friend, and of another which exhibited great solicitude about kittens—not its own—which had been accidentally buried under flooring, are at once suggestive and beautiful.

Diseases.—Besides being subject to common diseases like catarrh, diarrhoea, distemper, &c., cats are not unfrequently infested by parasites, either externally, as by the itch mite (*Sarcoptes cati*), causing swelling and baldness, and by fleas, or internally, by threadworms and tapeworms, and by the aberrant Pentastomum. Fits of vomiting are often due to small threadworms (*Ascaris mystax*) in the stomach, and *Ollulanus tricuspis*, another nematode, is even more important. The bladderworms of mice and rats become the tapeworms of the cat.

Superstitions regarding Cats.—Cats have been objects of superstition from the earliest ages. In Egypt they were held in the highest reverence; temples were erected in their honour; sacrifices and devotions were offered to them; and it was customary for the family in whose house a cat died to shave their eyebrows. In the middle ages, they were regarded as the familiars of witches. The favourite shape of Satan was said to be that of a black cat, and the animal was an object of dread instead of veneration. There is or was a belief among sailors, that the frolics of a cat at sea portended a storm. Many people still prophesy rainy weather from a cat washing over its ears or simply its face; and a cat-call on the housetop was formerly held to signify death. Their assumed connection with witches, and the belief that a cat has nine lives, have led to the perpetration of great cruelties upon this harmless and very useful domestic animal (see Brand's *Popular Antiquities*, Ellis's revised edition).

Importance.—As a destroyer of vermin the cat is of no little economic importance, and the connection (through field-mice and humble-bees) between cats and clover crops is one of the stock

instances of far-reaching influence. The more cats the fewer field-mice is evident enough; but as the latter ravage humble-bee nests and combs, we may say, the more cats the more humble-bees; but as the bees carry the fertilising dust from one purple clover flower to another, and as this fertilisation is essential to the perfecting of the crop of seeds, we may read the complex relation again, as Darwin has pointed out, connect the two extremes in saying the more cats the larger purple clover crop. The fur and skin are utilised. Most people will allow, however, that, utility apart, cats justify their existence as domestic pets.

See Mivart's monograph, *The Cat* (1880), on which the present article is largely based; Champfleury's *Cats Past and Present* (trans. 1885); Mrs Chance's *Book of Cats* (1898); Miss F. Simpson's *Book of the Cat* (1903).

Catabolism. See FUNCTION, PHYSIOLOGY, PROTOPLASM.

Cataclysmal Action, a term applied by geologists to the effects or destructive power of sudden deluges or debacles, which were supposed by some writers to have swept over certain countries.

Catacombs are subterranean cemeteries consisting of galleries or passages, with recesses excavated in the sides for tombs, but also of chambers designed for purposes of religious celebration and assembly. These are found principally in the Italian peninsula, but also in Sicily, Malta, Sardinia, Melos, Russia, Egypt, Palestine, and Northern Africa. In all there is a broad correspondence in design, though considerable differences in plan and structure do arise. The catacombs at Rome reveal a complexity unparalleled elsewhere. North of the Alps there are no catacombs in the proper sense of the term, the so-called catacombs of Paris being merely abandoned quarries, used after 1787 as depositories for bones brought from old cemeteries of the city. The known catacombs date for the most part from the 3d and 4th centuries of the Christian era. Many are earlier, some later. Those within Italy are of earliest origin.

The etymology of the term is doubtful, being connected with the Greek *kata*, and with the late Latin *accubitorium* (a tomb), or the Greek *kumbē* (a hollow). The word does not appear before the end of the 3d century, and then not as the name of a cemetery, but as the topographical designation (*ad catacumbas*, or *catacumbas*) of a particular district on the *Via Appia* near Rome. Near this region lay the underground cemetery of St Sebastian, celebrated as the temporary resting-place of the bodies of St Peter and St Paul. In the process of time the term *catacumbas* came to be expressly associated with this cemetery, which was one of the very few which remained known and accessible after the 8th century. The fame of this cemetery as a place of religious pilgrimage led apparently in the 9th century to the name which was proper to it being used in a generic sense to denote all similar underground burying-places.

Jewish catacombs have within recent times been discovered in Rome; a Saracen catacomb is to be found near Taormina in Sicily; there are catacombs of Egypto-Grecian construction at Alexandria; but catacombs generally are essentially of Christian origin. They are the outward manifestation, indeed, of two early Christian conceptions, the first that in death the Christian should be separated from the pagan, the second that subterranean burial was the most specifically Christian form of interment. The first of these ideas was really of Jewish origin. It produced the Jewish catacombs of Rome. To the Christian, of course, persuaded of the essential kinship in death of the faithful, the idea of common burial necessarily appealed with special force. Subterranean burial, as apart

from cremation, did not originate, of course, with the early church. It had been usual for the Phœnicians so to dispose of their dead, and from them the custom passed to the Etruscans, and from them in turn to the Jews and the Romans. At Rome cremation merely succeeded 'the older and better custom of inhumation,' which it never entirely superseded, and which was re-established in the 4th century. The early church, however, did give to subterranean burial an especial sanction. There is reason, indeed, to suppose that it



Plan of the Catacomb of St Agnes, Rome.

definitely enforced it as a mode of burial. A naïve conception of the doctrine of the resurrection was hardly reconcilable with cremation; subterranean burial was the custom of Judea, the cradle of the Christian religion; that form of burial had been hallowed by the example of the crucified Saviour, and was associated in him with hopes of resurrection. The position was, then, that Christians must be buried together, and that they must be buried subterraneously. The catacombs were the natural result. Their nuclei were the private sepulchres of the early Christians. These developed by degrees into great common burying-places, subject to the jurisdiction of the church.

Of all known catacombs, those of Rome are incomparably the most important. They are to be found at a distance of two to three miles from the Aurelian wall, the Roman law forbidding interment within the city. It was held for long that the catacombs of Rome were merely exhausted sand-pits, used by persecuted Christians for the burial of the martyrs—a Christian counterpart, indeed, of the burial-pits (*puticuli*, *puticulæ*) of Roman slaves. This idea, however, made necessary on the erroneous assumption that the catacombs were constructed in secret, has been completely discarded. In 1844 Marchi proved beyond all question that the catacombs of Rome were entirely of Christian construction, and from the first designed for places of sepulture.

They are excavated from the granular tufa, which is to be found almost everywhere in the neighbourhood of the city. This tufa—the second stratum from the surface—is too soft to be used for building purposes, but readily admits of excavation without any danger of collapse. As subterranean burying-places grew in number and importance a specialised class of excavators (*fossores*) arose, and came in course of time to form a sort of guild. Their craft was reckoned honourable, and they ranked as clergy of the lowest grade. The excavation of the underground cemeteries of Rome began with the construction of a stairway, which descended from the surface of the ground to a depth of some 30 or 40 feet, when

the granular tufa was reached. From this point diverged galleries (*ambulacra*), in height from 10 to 15 feet, and in breadth about 3. Side galleries branched off from these main galleries, intersecting other passages, and forming an intricate network of crossing and re-crossing corridors. These corridors were not merely passages of access to the subterranean cemetery: they constituted the



A Gallery with Tombs.

cemetery itself, the walls on both sides being pierced with tier above tier of horizontal recesses (*loculi*), the resting-places of the dead. To prevent the escape of putrefying gas—an important consideration where the cemeteries were to be used as places of assembly—these recesses were sealed by a marble slab, or by large tiles set in mortar, and on these epitaphs and inscriptions of various kind were written. For the wealthy and for the martyrs there were more imposing graves (*arcosolia*), where the body was placed in the space lying beneath a semicircular recess hollowed from the wall. In addition to the ordinary places of interment in the *ambulacra* the Roman catacombs contained a great number of sepulchral chambers (*cubicula*), each enshrining a larger or smaller number of dead. These were originally family burial-places, and from the date of their first construction served for the celebration of the eucharist and the agape on the occasion of the funeral and its anniversaries. Most of these *cubicula* were small, and incapable of containing more than a few worshippers. There were also, however, chambers of very much larger proportions, which were, undoubtedly, definitely constructed for purposes of religious assembly. The walls of all *cubicula* were coated with stucco, and richly decorated with religious paintings. The underground cemeteries of Rome were never confined to one level, but consisted almost always of various stories or *piani*, sometimes as many as five, and even on occasion seven, communicating by narrow flights of stairs, and by shafts and wells sunk for the admission of light and air. Many fables have been told of the extent of the catacombs of Rome. Forty cemeteries at least are known to have existed, and most of these were of considerable size. There is nothing, however, to support the idea that a perfect connection existed between all the cemeteries, making them to reach for many miles together. At the same time, it is perfectly certain that if the galleries could be extended in a straight line they would reach for some hundreds of miles. Estimates have varied

from 350 miles to 800 or 900. The number of graves is reckoned at six or seven millions by some, but at no more than two millions by others.

Tradition and documentary evidence have assigned several of the Roman catacombs to the first age of the church's history. For some an apostolic origin has been claimed. The earliest date vouchsafed is 72. Catacombs, however, were rare in the 1st and 2d centuries, and of small extent. It is not till the beginning of the 3d that the typical Christian subterranean cemetery appears. The existence of these early cemeteries was assuredly known to the powers at Rome. Their entrances, undisguised, face the public roads. Even though concealment had been desired, the nature of the work of construction would have rendered it impossible. But in any case the Roman law which sanctioned the slaughter of the Christians rigorously protected their tombs. From the year 65 to the middle of the 3d century there was no general religious persecution in Rome, and it is certain that during that period the Christians enjoyed peaceful occupation of the catacombs. During the next half-century, however, with its intervals of religious persecution, the case was altered. Though the extent of the public use of catacombs for purposes of worship and concealment during periods of persecution has undoubtedly been greatly exaggerated, it is too much to suppose that these underground cemeteries did not very frequently provide a safe retreat to harried bands of Christians. When used for such purposes, however, they naturally became liable to attack. Thus Christians were martyred as they celebrated in the tombs the holy mysteries, and in 253 a decree of Valerian forbade Christians 'to assemble in those places which they call cemeteries.' In the year following the edict was revoked, and the catacombs subsequently appear as enjoying good or evil fortune, according to the varying fortunes of the church itself. During the persecution of Diocletian in 303 they were altogether confiscated, though restored again to the bishop of Rome some little time thereafter. It is to these times of trial, before the final peace of the church under Constantine in 313, that one must trace those attempts to conceal the existence of the catacombs by structural alterations of various kinds. The same period also gave rise to an involved and enigmatic system of Christian epigraphy.

The recognition of the Christian faith by Constantine in no sense ended the custom of subterranean burial in Rome. From that time onwards, however, the practice gradually declined, partly, it would seem, because the localities suited to the purpose were exhausted, until, with the Gothic invasion of Rome under Alaric in 410, it altogether ceased. There was one exception. The second half of the 4th century witnessed a brief outburst of desire on the part of the faithful to secure places of burial as near as possible to the tombs of the saints and the martyrs. This outburst of desire reflects indirectly the new era which opened in the history of the catacombs when the ages of persecution had ceased. The catacombs at Rome then became not places of burial in the first instance, but centres rather of religious interest. Thus in the latter part of the 4th century Christians flocked to Rome from every land, and the crypt of every martyr of renown became a pilgrim shrine. To meet the requirements of pilgrims many structural alterations were made in the catacombs. It was during this period, too, that Constantine caused basilicas to be raised above the tombs of the principal martyrs, and that Pope Damasus sought to adorn the graves of the faithful with precious metals and with marble. This transformation of the catacombs into places of religious pilgrimage

made them, one must suppose, lucrative fields for spoliation; and though there is no direct evidence of the fact, the underground cemeteries of Rome were almost certainly sacked by the Goths in 410, and again in 457. Throughout this century, however, the restoration and decoration of the catacombs as places of religious interest was continued by successive pontiffs. But not so in the centuries following. From the 6th century onwards there is an almost complete decay of reverence for the catacombs. The ravages of the Goths under Vitiges in 537, the even greater havoc wrought by the Lombards in 756, and further spoliations by the Goths under Adolphus in 956, contributed largely to this result. The subterranean cemeteries of Rome were left to complete decay. Sheep and oxen invaded the shrines, defiling them everywhere with unspeakable corruption. It was then that the spoliation of the catacombs by the hand of the church itself began. To prevent further desecration and destruction the bones of the martyrs and the relics of the saints were largely removed by successive popes to places of greater safety. With their removal the living history of the catacombs may be said to end. From time to time efforts were made by different popes to keep alive an interest in them, and when basilicas had been built over them some were still occasionally visited, but for the most part they were neglected and forgotten. When they next appear it is in the early 15th century, and then as objects of archaeological interest. It is really, however, to the 16th century that the rediscovery of the catacombs must be dated. A landslide at Rome in 1578 fortuitously revealed their presence. Since then the catacombs have been the subject of continuous archaeological study and research. Antonio Bosio, with his standard though incomplete work, published posthumously in 1632, was the pioneer. Later writers added little that was new till the appearance in the 19th century of Padre Marchi and Giovanni de Rossi, restorers both of the science of Christian archaeology.

The catacombs of Rome form without doubt the most notable monument of primitive Christianity which has come down to us. The inscriptions, frequently dated, give the name of the deceased (generally the cognomen), his relationship to the survivor, his rank and occupation. From such data it has been found possible to tell of the nature of the coming of Christianity, of the manner of its spread, of its influence on social and family relationship, and also of the early organisation of the church. These inscriptions, however, contain also expressions of pious aspiration, the hope of resurrection in especial. There is a total lack of the blank despair or impious defiance which mark so many pagan epitaphs. These expressions of hope, brief at first, such as *Pax tecum, Pax tibi, Vivas in Deo, Vivas cum Sanctis*, were in the 4th century developed at much greater length. In the 3d century, under the influence of persecution, they appeared in the form of Christian symbolism—the fish, the cross, the lamb and the dove, the anchor, the palm and the olive branch, all appear as symbolic of Christ, of sacrifice, of the soul, of hope, of victory over sin, of peace. All, inscriptions and symbols alike, constitute a record of the religious conceptions and dogma of the early church. In their varying tone, too, the inscriptions frequently reveal the manner in which the faith of the church became in time tinged with worldly influence. Paintings, representing, through the medium of Old and New Testament subjects, ideas similar to those expressed in the inscriptions (the hope of resurrection being again most prominent), are equally important as a record of early Christian faith and dogma. But they are of value also as frequently portraying

actual scenes of Christian worship. Not only so; in themselves they constitute a history of early Christian art from its beginning in paganism to its assumption of a definitely Christian character.

In the catacombs of Rome, however, is reflected not merely the religious but also the civil life of the first centuries. Thus the inscriptions of the tombstones, with their mention of physicians, bakers, smiths, joiners, &c., reveal what were the various employments of the time. Carvings of tools are not infrequently to be found, while very often that universal human instinct which causes the bereaved to lay by the departed some object which has lost its use through the death of the possessor has led to these tools themselves being actually deposited in the grave. The same instinct accounts also for the presence of many other objects—urns, money-jars, masks, dice, rugs, toys, &c.—all instructive of daily life in Rome. Of articles belonging to women there are very many—mirrors, combs, bodkins, pins, vinaigrettes, bracelets, armlets, ear-rings, necklaces, buckles, brooches, studs, seals, buttons, &c.

Outside Rome catacombs have been found at some twenty places in Italy. Those of Naples are undoubtedly the most important. These catacombs, unlike the underground cemeteries of Rome, were almost certainly in the first instance quarries. The nature of the soil from which they have been excavated has allowed of the construction of lofty corridors and spacious chambers to which there is nothing comparable at Rome. In other respects, however, in mode of interment, decoration, &c., there is no material point of contrast. The catacombs of Syracuse in Sicily are perhaps the most extensive outside the peninsula of Italy. Apart from one or two of minor importance, they are three in number, and form a great necropolis of several stories undermining nearly the whole of that portion of the ancient city which was known as Achradina. They date from the 3d and 4th centuries. In arrangement they differ widely from the catacombs at Rome. Thus the galleries and passages radiating from great circular halls do not proceed interminably or at random, but take upon themselves rather the definite form of Latin crosses. Conscious design is everywhere apparent, and the general mode of construction is more ambitious than at Rome. Though ravaged in turn by the Vandals, the Ostrogoths, and the Saracens, the catacombs of Syracuse have yielded in paintings and inscriptions valuable treasures to the archaeologist. Catacombs of lesser extent have been discovered in Sicily at Grazia di Carini, at Palermo, and near Girgenti. In the Saracen catacomb at Taormina the resting-places of the dead, contrary to the custom at Rome, run endwise into the walls of the *ambulacra*. The catacombs of Malta at Abbatiaad-Deyr and Tal-Liebru date from the 4th and 5th centuries. They are peculiarly irregular in construction. Their passages are very narrow, and have arched ceilings. Interments are here less numerous than in any other catacombs, and embellishments of every kind, whether in the form of inscriptions or paintings, are altogether lacking. The catacombs of Sardinia date from the 5th century. They are situated at San Antioco, and would seem to have developed out of a group of Punic tombs. In this respect they resemble the catacombs of Sicily. The catacombs of Melos are to be found at Trypiti, and date from the 4th century. In Crimea catacombs dating from the 5th century have been discovered at Kertch. The so-called catacombs of Kieff are the remains really of the cave-dwellings of early ascetics, who were buried as they lived, subterraneously. The catacombs of Egypt are at Alexandria. Some are of Christian, some of Egypto-Grecian, origin. The former are small, but

richly decorated with paintings. The latter are extensive, and distinct in design from anything at Rome or elsewhere. Their most outstanding feature is a remarkable regularity in construction. In all the catacombs of Alexandria the graves run perpendicularly to the subterranean corridors, as they do also at Saida (Sidon) in Palestine, where there are extensive catacombs. The catacombs of Northern Africa are to be found at Hadrumetum, near Sousse, and at Arch-Zara.

For the catacombs of Rome, see Bosio, *Roma Sotteranea* (1632); Marchi, *Monumenti delle arti cristiane primitive* (1844); De Rossi, *La Roma Sotteranea* (1864-77), and *Inscriptiones Christiane* (1857-61); Allard, *Les Catacombes de Rome* (1896); Marucchi, *Le Catacombe romane* (1903); Besnier, *Les Catacombes de Rome* (1908); in English, Northcote and Brownlow, *Roma Sotteranea* (1878-80), a condensation of De Rossi's work, and their *Epitaphs of the Catacombs* (1878); also Marriott, *The Testimony of the Catacombs* (1870); and B. Scott, *The Contents and Teaching of the Catacombs at Rome* (1919). For catacombs outside Rome, see Bellermann, *Über die ältesten christlichen Begräbnisstätten und besonders die Katacomben zu Neapel* (1839); Führer, *Forschungen zur Sicilia sotteranea* (1897); Caruana, *Ancient Pagan Tombs and Christian Cemeteries in the Islands of Malta* (1898); Kulakovsky, *Materials for Russian Archaeology* (1896); Neroutsos Bey, *L'Ancienne Alexandrie*; Leynard, *Les Catacombes d'Hadrumète* (1904-5).

Catafalque (Ital. *catafalco*; 'a scaffold'), a temporary structure of carpentry, a kind of baldachin, intended to represent a tomb, and placed over the coffin of distinguished persons during the funeral rites preceding interment, as also sometimes over the grave, where it was usually left for several months. The most splendid on record was Michelangelo's, which was adorned by the greatest architects, sculptors, and painters of the day. There were also portable catafalques for processions.

Catalani. See CATALONIA, PROVENÇAL, SPAIN.

Catalani, ANGELICA, an Italian singer, born in 1779 at Sinigaglia, near Ancona, was educated in the convent of Sta Lucia, near Rome, where, in her seventh year, strangers flocked from all quarters to hear her sing. Making her début at Venice in 1797, she experienced a succession of triumphs in every country in Europe for upwards of thirty years, making vast sums of money. The Italian Opera in Paris was twice under her direction; but her husband's interference and extravagance brought her into much trouble. Her large queenly person and fine countenance, the immense volume, range, and flexibility of her voice, her power of sustaining her notes, in contrast with the lightness and facility of her unerring execution, everywhere took her audience by storm. Her expression, although fine, and her whole style, surprised rather than touched the heart. She retired from the stage in 1827, and three years later purchased a villa near Florence, where she gave free instruction to girls who had a talent for singing. In 1849 she repaired with her daughters to Paris, where she died of cholera on the 13th of June.

Catalase. See FERMENTATION.

Catalaunian Plain, the ancient name of the plain surrounding Châlons-sur-Marne (q.v.), scene of the great battle in 451 A.D. between the Goths and the Huns. See ATTILA.

Catalepsy (*katalēpsis*, 'a taking possession of'), a state of more or less complete insensibility, with absence of the power of voluntary motion, and statue-like fixedness of the body and limbs in the attitude immediately preceding the attack, or in any position in which they may be placed by another person, for a considerable period, often until the return of consciousness. The attack may

last only a few minutes, or any longer period. The patient is usually in good health at the time of seizure, or subject only to nervous affections, such as Hysteria (q.v.); sometimes the attack is preceded by disappointment, fear, violent exciting or depressing passions, or religious emotions, being in such cases only an extreme form of what is otherwise called trance, reverie, or ecstasy; on other occasions the apparent cause is more purely physical, as in some of the hysterical cases. Patients rarely die during the attack, which may, however, be protracted for an indefinite period, and may even endanger life indirectly by the debility consequent on imperfect nourishment. The circulation and respiration are in most instances little affected; but cases have been recorded in which the patient has been supposed to be dead. Occasionally the same cataleptic rigidity of the muscles is present without any interference with consciousness. Many of the recorded cases of catalepsy are little worthy of credit, and it has even been doubted whether it can ever be said to exist exempt from some degree of deception, or at least voluntary and conscious regulation of the muscles. In epidemic catalepsy imitation must plainly have been at work. Moral means form a large part of the treatment, as in hysteria. In some cases it may become necessary to administer food by means of the stomach-pump.

Cataloguing of libraries is an art practised under various systems of rigid rules, such as those of the British Museum, the Bodleian, and the Library Association of the United Kingdom. Each entry may be made on a separate card, and the cards arranged in order; or the catalogue may be in book form. A card catalogue has the advantage of allowing indefinite expansion. The principle on which titles are arranged varies. In old catalogues books were often classified as folio, quarto, &c.—an arrangement with little to recommend it. For some purposes of library management a shelf catalogue is useful. For public use author and subject catalogues are best. In the former, titles appear under the authors' names in alphabetic order. In a subject catalogue they are grouped according to subject, either alphabetically or after some scheme of classification. Thus the Dewey system assigns to each subject a number of three or more figures, of which the first indicates one of the ten main groups, the second, one of its ten divisions, the third, one of the ten subdivisions.

Catalonia (Span. *Cataluña*), an old principality of Spain, triangular in shape, occupying the north-east portion of the peninsula, and now divided into the provinces of Barcelona, Tarragona, Lérida, and Girona. Total area, 12,400 sq. m.; with a pop. of 2,400,000. Catalonia is the principal manufacturing province of the kingdom—'the Lancashire of Spain.' The language, costume, and habits of the inhabitants, who regard with contempt and pity the Spaniards of the surrounding provinces, are quite distinct from those of the rest of Spain, whose people they greatly surpass in energy, industry, and intelligence. They are honest, frugal, and enterprising; but this love of liberty has frequently developed a strong revolutionary spirit, and they are extremely passionate, revengeful, and egotistical. Even the educated classes speak the rough Catalan dialect, more nearly akin to Provençal than to Castilian, and dating back to the time when the province was part of the Frankish empire; for this and their literature, see SPAIN.

Catalonia, under the name of *Hispania Tarraconensis*, was considered, from its position, an important province of Roman Spain. It was invaded and captured by the Alani, who were followed by

the Goths, hence its name, *Gothalanica*, changed into *Gothalunia* or *Catalonia*. In the 8th century the Arabs gained possession of the southern part. When Charlemagne in 788 subjugated Spain as far as the Ebro, Catalonia formed the central portion of the Spanish mark; and in the beginning of the following century, when Louis the Pious of Aquitania had helped to finally drive the Arabs out, this division was restored, and broken up into fifteen counties, under Frankish lords. The counts of Barcelona, however, soon made themselves independent of France, and founded the principality of Barcelona. In 1137 Earl Ramon Berengar IV., by his marriage with the heiress of Aragon, united Catalonia with that kingdom; and the marriage of Ferdinand and Isabella united both with Castile. Thus Catalonia became an integral portion of the Spanish monarchy (1479), though never a very peaceable one. It has repeatedly taken a prominent share in Carlist and more recently in republican or anarchist insurrections. See histories of Catalonia by Balaguer (1885-87) and Bori y Fontestà (1898).

Catalpa, an interesting genus of hardy trees of the order Bignoniaceæ, of which two species are natives of the United States, and two others (decidedly distinct) of Japan. The genus was named by Catesby, probably from the Catawba River, where he first found them in 1726. The Common Catalpa (*C. bignonioides*) known also as the Bean-tree, Catawba, Indian Bean, and Cigar-tree, is a low and much-branched tree, seldom more than 30 or 40 feet high, extensively grown in the northern states and in southern Europe for ornament, but naturally found chiefly in the Gulf states. Its wood is light, soft, and not strong, but exceedingly durable. It is used for fence-posts, rails, and railway sleepers. Still more noteworthy is the Western Catalpa or Shawnee Wood (*C. speciosa*), which is a much larger and handsomer tree, now largely planted for ornament and in timber preserves. Its wood is soft, light, and durable, and is very useful, not only for the commoner and coarser purposes of the carpenter, but also for cabinetmakers' and joiners' use. *C. longissima* has been called *Chêne des Antilles* on account of the excellence of its timber. The bark is a source of tannin. The Japanese Catalpas are small and unimportant. The low habit, the profuse blossoms, and the long, cigar-like, pendent pods of the catalpas are easy marks of distinction from other trees.

Catalysis (Gr., 'dissolution') is a term applied in Chemical Physics to a force supposed to be exerted by one substance upon a second, whereby the latter is subjected to change or decomposition, whilst the former, or acting substance, remains comparatively unaltered, and does not combine with it. The force, indeed, has been ascribed to the mere 'action of contact.' Fermentation (q.v.) is an example of this force (see BEER), when one part of yeast acting upon the sugar of the sweet worts, without entering into combination with it, compels 100 parts of sugar to pass into alcohol and carbonic acid. So also, when platinum or gold is brought in contact with peroxide of hydrogen, the latter is decomposed, while the metal remains unchanged. No final explanation has been brought forward to account for these changes, or to define what the force of catalysis is. The action is probably electrolytic.

Catamaran (a Tamil word) is a raft formed usually of three pieces of wood lashed together, the middle piece being longer than the others, and serving as a keel; on this the rower kneels or squats, and works a paddle. These simple vessels are used by the natives of Madras to maintain communication between ships and the shore, ordinary boats being rendered unsafe by the surf.

Larger catamarans, consisting of three logs of wood tapered at the end and lashed together, and carrying a sail, are used in South America. In the United States the name is applied to double boats, similar to the Proa (q.v.) of the Ladrões. Some of these have been propelled by steam, but they have not proved successful. In the last quarter of the 19th century there was considerable development in the use of small double-hulled sailing-boats for racing purposes. Those in which the two hulls are rigidly connected are not satisfactory in rough weather, but in smooth water they are both fast and safe, and they are easily managed. The name catamaran is also applied, in the American navy, to a balsa, or framework supported by two floats, and to a float used in cleaning the side of a ship.

Catamarca, a western province of the Argentine Republic, sinking SE. from the Andes to the Salt Marshes (Salinas Grandes). Almost two-thirds of its surface is mountain or waterless desert, where the rivers are lost in the sands; but the remainder is very fertile, and yields much wine and corn, besides supporting large herds of cattle. Only copper has been much mined. Area, 40,000 sq. m.; pop. 100,000. —Catamarca, the capital, lies 82 miles NE. of Rioja. Pop. 13,000.

Catamenia. See MENSTRUATION.

Catamount, a name for the Puma (q.v.), applied also, as is Catamountain, to other Felidæ.

Catania, a city and seaport of Sicily, near the foot of Mount Etna, 59 miles by rail SSW. of Messina, and 54 NNW. of Syracuse. The fertile and well-cultivated plain of Catania, extending along the south-east base of Mount Etna, is styled 'the granary of Sicily,' and has given to Catania the title, 'La Bella Catania.' By eruptions of the great volcano and attendant earthquakes, the city has been several times almost entirely destroyed—especially in 1669 and 1693; but out of its ruins it has always risen with increased beauty, and it is now the finest city in Sicily, being built throughout on a beautiful and consistent plan, from which no deviation is allowed. The harbour of Catania, formerly good, was choked by a stream of lava in 1669, and is still unsafe, in spite of a mole constructed at great expense. Of several squares, the finest, in front of the cathedral, has a fountain with an ancient statue of a lava elephant bearing a granite obelisk. Among the chief buildings are the Benedictine convent of San Nicola, secularised in 1866; the cathedral, founded by Roger I. in 1091, and containing the relics of St Agatha; and the university, founded in 1445. Pop. of town (commune, 1911), 211,699; of province, 783,862. The Catanians are distinguished for their commercial spirit and industry. Catania has manufactures of silk and linen goods, and of articles in amber, lava, wood, &c. Among the remains of ancient times that earthquakes have spared, are those of a theatre, a temple of Ceres, Roman baths, and an aqueduct. The ancient *Catana* was founded by a Greek colony of Chalcidic origin, in the latter part of the 8th century B. C., and as early as the beginning of the 5th was esteemed one of the most flourishing towns in Sicily. It was taken by the Athenians under Nicias, and was desolated by Dionysius I.; but again rose under the Roman sway into its former importance. It suffered at the hands of the Goths, but once more, under the Byzantine empire, became one of the principal cities in the island.

Catanzaro, a city of South Italy, on a rocky hill 6 miles from the Gulf of Squillace, and 326 SE. of Naples by rail. It has a cathedral, a ruined castle of Robert Guiscard, and a college. Catanzaro suffered very severely by an earthquake in 1783. It

has manufactures of silk, velvet, and woollen fabrics, and an active trade. Pop. 34,000. The province of Catanzaro has an area of 2000 sq. m., and a pop. of 484,600.

Cataplasm. See **POULTICE**.

Catapulta, an engine of war resembling the Ballista (q.v.), but used to discharge an arrow, not a stone.

Cataract, an opaque condition of the lens of the eye. It is readily distinguished from opacities of the cornea, or clear front part of the eye, by its position just behind the pupil—that round and varying aperture in the iris through which light is admitted into the back of the eye. Cataract may affect the lens alone (lenticular cataract), or the front or back of the capsule of the lens (capsular cataract), or both lens and capsule (capsulo-lenticular cataract). Its colour varies from pearly white to dark amber; but the lighter shades are much the most common. Heat will produce a like change on the lens out of the body, just as it changes white of egg from transparent to opaque. The rounded lens of the fish is seen at table in this opaque condition.

Cataract, especially in some of the forms which are present at birth or appear in infancy, may remain confined to one part of the lens; but in the vast majority of cases it gradually extends till the whole of the lens substance has become opaque. The most useful classification of cataracts is that according to the circumstances under which they develop; and the most important groups are *Congenital Cataract*, present at birth; *Diabetic Cataract*, caused by diabetes; *Traumatic Cataract*, the result of injury; *Senile Cataract*, coming on spontaneously after middle life (far the most common form); and *Secondary Cataract*, following some other disease of the eye.

Cataract is painless, and unaccompanied by inflammation. It occasions blindness simply by obstructing the passage of the light; but cataract alone does not produce such complete blindness that the patient cannot tell light, even faint light, from darkness. If an eye affected with cataract be unable to do this, it is certain that there is some serious disease in its deeper structures which would render the removal of the cataract quite useless for the restoration of vision.

With regard to the causes of cataract much is still uncertain. It is known that it results from injuries to the lens and from many serious diseases of other structures in the eye; that it is a common result of diabetes, and possibly of other constitutional diseases; that when it comes on without any such obvious cause the tendency to it is often hereditary, but rarely manifests itself before forty-five; and that after that age it becomes more and more common with advancing years. But what is the nature of the constitutional weakness or the structural defect which leads to its development has yet to be discovered.

No medical or other treatment yet known has any influence in arresting the progress of cataract, nor can it be cured but by a surgical operation. In cases where the cataract begins in the centre of the lens, some improvement of vision can be effected in the earlier stages by enlarging the pupil, and so allowing the rays of light to enter the eye through parts of the lens still transparent. This is some-

times done by the use of dark glasses, but usually by means of Belladonna or Atropia (q.v.) dropped into the eye. The latter method is often resorted to by quacks, who when they find their victims' sight improved by this means, promise a speedy disappearance of the cataract. The patient being able to see somewhat better, after long and increasing dimness of vision, begins to congratulate himself on a cure; the quack, of course, hastens to get his money without waiting for the further result, which is sure to be blank disappointment. So long as there is fair vision with one eye, the operation on the other may be delayed. It is a mistake to delay the operation in children on account of their tender age. The sooner it is done the better, both for the eye and the education of the child.

Till the middle of the 18th century the only recognised operation for cataract was *depression* or *couching*, a procedure by which the opaque lens was pushed downwards and backwards into the vitreous humour, leaving the pupil free. This method, though occasionally very successful, was often followed by severe inflammation and total loss of sight, and is now quite abandoned in favour of *solution* and *extraction*. The former is generally preferred in patients below thirty, in whom the cataract, like the healthy lens, is usually so soft that it can readily be broken up; and the latter at more advanced ages.

In *solution* an appropriate needle is passed through the cornea; made to open and lacerate the front of the capsule, the rags of which curl out of the way behind the iris, so that their subsequent opacity does not obstruct the light; then the soft cataractous lens is punctured and torn up so as more effectually to admit the aqueous humour, which naturally fills the space between the lens and the cornea, and which has the remarkable property of absorbing or dissolving the lens or cataract when admitted within the capsule. This operation may require to be repeated several times, at intervals of a few weeks, before the whole cataract is dissolved.

Many methods of performing *extraction*, differing much in detail, have been practised. But all consist essentially of an incision at or near the margin of the cornea of sufficient length to permit of the removal of the entire lens, or at all events of its hard central nucleus. Most surgeons of the present day remove a portion of the iris (the coloured part of the eye), either at the same time or by a previous operation; and most tear the capsule of the lens and remove only its contents, though some extract the lens with its coverings. The performance of this operation has been much facilitated by the introduction of Cocain (q.v.); and its results have been improved since the antiseptic method has been applied to it. It now proves successful in skilful hands in considerably more than 90 per cent. of eyes where cataract is the only disease present.

After the lens has been removed, it is never re-formed, and the refractive power of the eye is much diminished, while its accommodation is entirely lost. It is therefore necessary that a strong spectacle-glass be worn in order that clear sight may be obtained; and different glasses are required for distant and for near objects (reading, &c.). With such glasses, however, the perception of objects directly looked at is sometimes as clear as ever. See **EYE**.

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